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North
American
Dräger

Dräger

Operator's Instruction Manual

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Narkomed 4
Anesthesia System

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Section 1
Introduction

Operator's Responsibility for Patient Safety

North American Dräger anesthesia products are designed to provide the greatest degree of patient safety that is practically and technologically feasible. The design of the equipment, the accompanying literature, and the labeling on the equipment take into consideration that the purchase and use of the equipment are restricted to trained professionals, and that certain inherent characteristics of the equipment are known to the trained operator. Instructions, warnings, and caution statements are limited, therefore, to the specifics of the North American Dräger design. This publication excludes references to hazards which are obvious to a medical professional, to the consequences of product misuse, and to potentially adverse effects in patients with abnormal conditions. Product modification or misuse can be dangerous. North American Dräger disclaims all liability for the consequences of product alterations or modifications, as well as for the consequences which might result from the combination of North American Dräger products with products supplied by other manufacturers if such a combination is not endorsed by North American Dräger.

The operator of the anesthesia system must recognize that the means of monitoring and discovering hazardous conditions are specific to the composition of the system and the various components of the system. It is the operator, and not the various manufacturers or suppliers of components, who has control over the final composition and arrangement of the anesthesia system used in the operating room. Therefore, the responsibility for choosing the appropriate safety monitoring devices rests with the operator and user of the equipment.

Patient safety may be achieved through a variety of different means depending on the institutional procedures, the preference of the operator, and the application of the system. These means range from electronic surveillance of equipment performance and patient condition to simple, direct contact between operator and patient (direct observation of clinical signs). The responsibility for the selection of the best level of patient monitoring belongs solely to the equipment operator. To this extent, the manufacturer, North American Dräger, disclaims responsibility for the adequacy of the monitoring package selected for use with the anesthesia system. However, North American Dräger is available for consultation to discuss monitoring options for different applications.

Section 1
Introduction

Limitation of Liability

North American Dräger's liability, whether arising from or related to the manufacture and sale of the products, their installation, demonstration, sales representation, use, performance, or otherwise, including any liability based upon North American Dräger's product warranty, is subject to and limited to the exclusive terms of North American Dräger's limited warranty, whether based upon breach of warranty or any other cause of action whatsoever, regardless of any fault attributable to North American Dräger and regardless of the form of action (including, without limitation, breach of warranty, negligence, strict liability, or otherwise).

North American Dräger shall in no event be liable for any special, incidental, or consequential damages (including loss of profits) whether or not foreseeable and even if North American Dräger has been advised of the possibility of such loss or damage. North American Dräger disclaims any liability arising from a combination of its product with products from another manufacturer if the combination has not been endorsed by North American Dräger. Buyer understands that the remedies noted in North American Dräger's limited warranty are its sole and exclusive remedies.

Furthermore, buyer acknowledges that the consideration for the products, equipment, and parts sold reflects the allocation of risk and the limitations of liability referenced herein.

Restriction

Federal law restricts this device to sale by, or on the order of, a physician.

Symbol Definition

The following symbols appear on the label on the back of the machine and are defined below.

CAUTION: Refer to accompanying documents before operating equipment.

ATTENTION: Consulter les documents ci-joints avant de faire fonctionner l'apparail.

CAUTION: Risk of electric shock, do not remove cover. Refer servicing to a North American Dräger qualified technical service representative.

ATTENTION: Risque de choc electrique, ne pas enlever le couvercle. Ne faire reparer que par un representant technique autorise de North American Dräger.

Degree of protection against electric shock: Type B.
Protection contre le risque de choc electrique: Type B.

These additional symbols are used on other locations of the machine to provide quick and easy recognition of product functions.

OXYGEN CONCENTRATION

BREATHING VOLUME

BREATHING PRESSURE

BLOOD PRESSURE

ARTERIAL OXYGEN SATURATION

AUDIBLE ALARM DISABLE

How This Manual Is Organized

All users of the Narkomed 4 must read this manual completely before using the machine. In order to make this document more convenient for future reference, it has been divided into several independent sections.

Section 2, “General Description,” provides a summary of Narkomed 4 features and functions.

Section 3, “Daily Checkout,” contains the checkout procedures that must done on a daily basis.

Section 4, “Preuse Checkout,” contains the checkout procedures to be performed between successive cases.

Section 5, “Operation,” provides detailed instructions on the use and operation of each functional component of the system.

Section 6, “Routine Maintenance and Cleaning,” provides replacement, maintenance, and cleaning procedures.

Section 7, “Specifications,” contains the specifications for all system components.

Section 1
Introduction

Conventions Used in This Manual

This manual has been set up with several conventions to help organize the information contained in it. Please read about these conventions carefully so that you understand their significance in the manual.

Typefaces

Different typefaces are used throughout the manual to differentiate between narrative information and machine messages and labels.

Warnings and Cautions

All parts of this manual contain warning and caution statements about the Narkomed 4.

- *Warning* statements give important information that, if ignored, could lead directly to a patient's or operator's injury.
- *Caution* statements give important information that, if ignored, could lead directly to equipment damage and, indirectly, to a patient's injury.

General Warnings and Cautions

The following list of warnings and cautions apply to general operation and maintenance of the Narkomed 4. Warnings and cautions about installing and operating specific parts appear with those topics.

WARNING: Any person involved with the setup, operation, or maintenance of the Narkomed 4 anesthesia system must be thoroughly familiar with this instruction manual.

WARNING: This anesthesia system will not respond automatically to certain changes in patient condition, operator error, or failure of components. The system is designed to be operated under the constant surveillance and control of a qualified operator.

WARNING: No third-party components shall be attached to the anesthesia machine, ventilator, or breathing system (except for certain approved exceptions). Contact the North American Dräger technical service department for further information.

WARNING: When moving the anesthesia machine, remove all monitors and equipment from the top shelf, remove the absorber system, and use only the machine handles or push/pull bars. The anesthesia machine should only be moved by people who are physically capable of handling its weight. North American Dräger recommends that two people move the anesthesia machine to aid in maneuverability. Exercise special care so that the machine does not tip when moving up or down inclines, around corners, and across thresholds (for example, in door frames and elevators). Do not attempt to pull the machine over any hoses, cords, or other obstacles on the floor.

CAUTION: Although the Narkomed 4 is designed to minimize the effects of ambient radio-frequency interference, machine functions may be adversely affected by the operation of electrosurgical equipment or short wave or microwave diathermy equipment in the vicinity.

CAUTION: Communications with external equipment may be temporarily affected by electromagnetic interference due to the use of electrosurgical equipment.

CAUTION: Do not place sensitive electronic equipment on or adjacent to the display screen.

CAUTION: Do not place more than 100 pounds on top of the Narkomed 4 monitor housing.

Recommendations

In the interest of patient safety, North American Dräger strongly advocates the use of an oxygen analyzer, pressure monitor, and either a volume monitor or an end-tidal CO_2 monitor in the breathing circuit at all times.

Because of the sophisticated nature of North American Dräger anesthesia equipment and its critical importance in the operating room setting, it is highly recommended that only appropriately trained and experienced professionals be permitted to service and maintain this equipment. Please contact North American Dräger's Technical Service Department at (800) 543-5047 for service of this equipment.

North American Dräger also recommends that its anesthesia equipment be serviced at three-month intervals. Periodic Manufacturer's Service Agreements are available for equipment manufactured by North American Dräger. For further information concerning these agreements, contact the North American Dräger Technical Service Department at (800) 543-5047.

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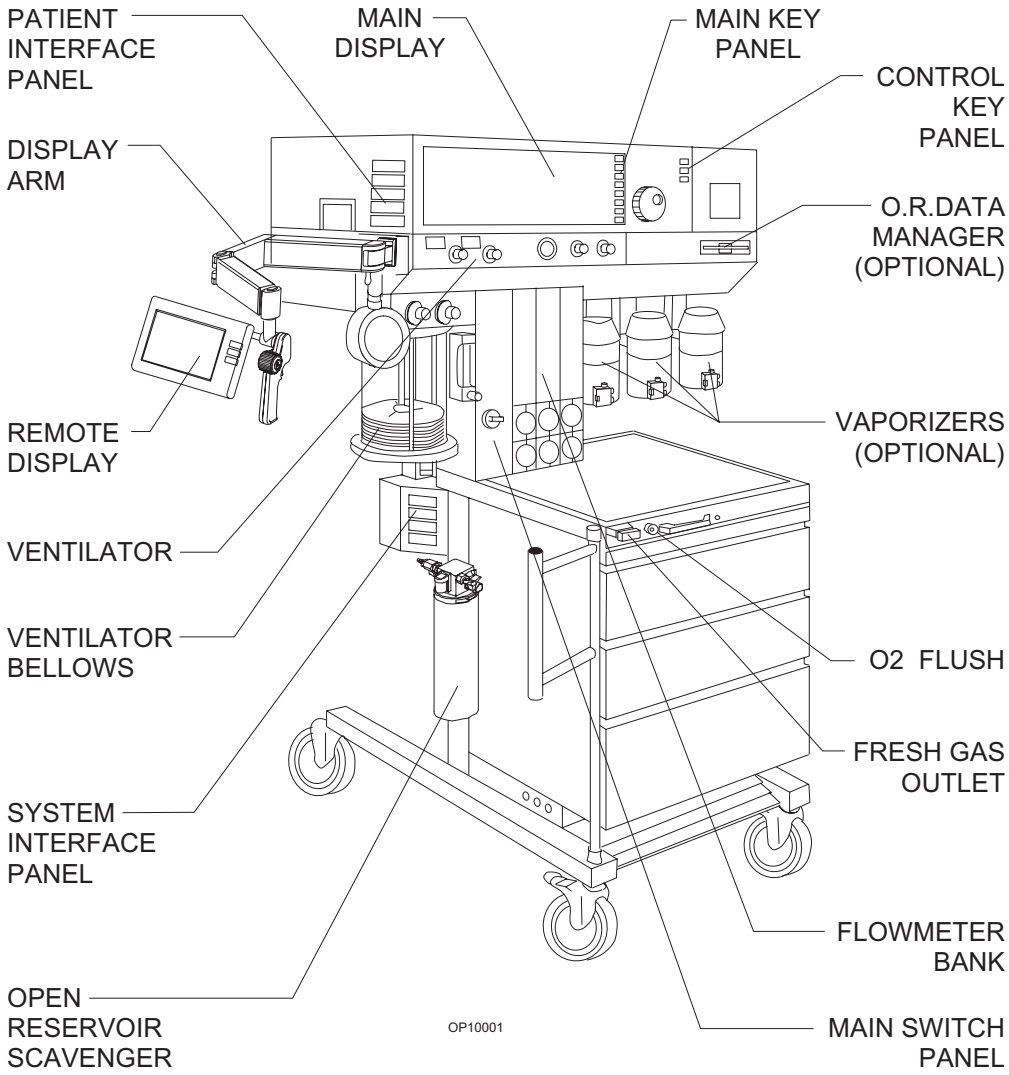
Section 2
General Description

Overview

The Narkomed® 4 is a continuous flow anesthesia system. All Narkomed 4 machines are equipped with a monitoring system and pneumatic circuitry for delivering gases and anesthetic vapor. A front view of the Narkomed 4 is shown in the figure below.



Gas Delivery System

The pneumatic system can simultaneously deliver up to four gases and one anesthetic agent (from a selection of up to three). Oxygen and nitrous oxide are standard on all Narkomed 4 machines. Optional gases are air and carbon dioxide. Gas is supplied to the system through pipelines and cylinders. Connections for oxygen and nitrous oxide are standard on all machines, and a pipeline connection for air is also available. Gas cylinder yokes are available for up to two oxygen cylinders and two nitrous oxide cylinders, plus one additional cylinder for a third gas.

Section 2
General Description

Color Coding

Each connection, valve, gauge, and flowmeter is labeled and color-coded for the appropriate gas, as shown in the table below.

GAS SYSTEM COLOR CODING				
GAS	**MARKING**	**USA**	**GERMANY**	**ISO**
Air	AIR	Yellow	Yellow	Black/White Checkered
Carbon Dioxide	CO_2	Gray	Black	Gray
Nitrous Oxide	N_2O	Blue	Gray	Blue
Oxygen	O_2	Green	Blue	White

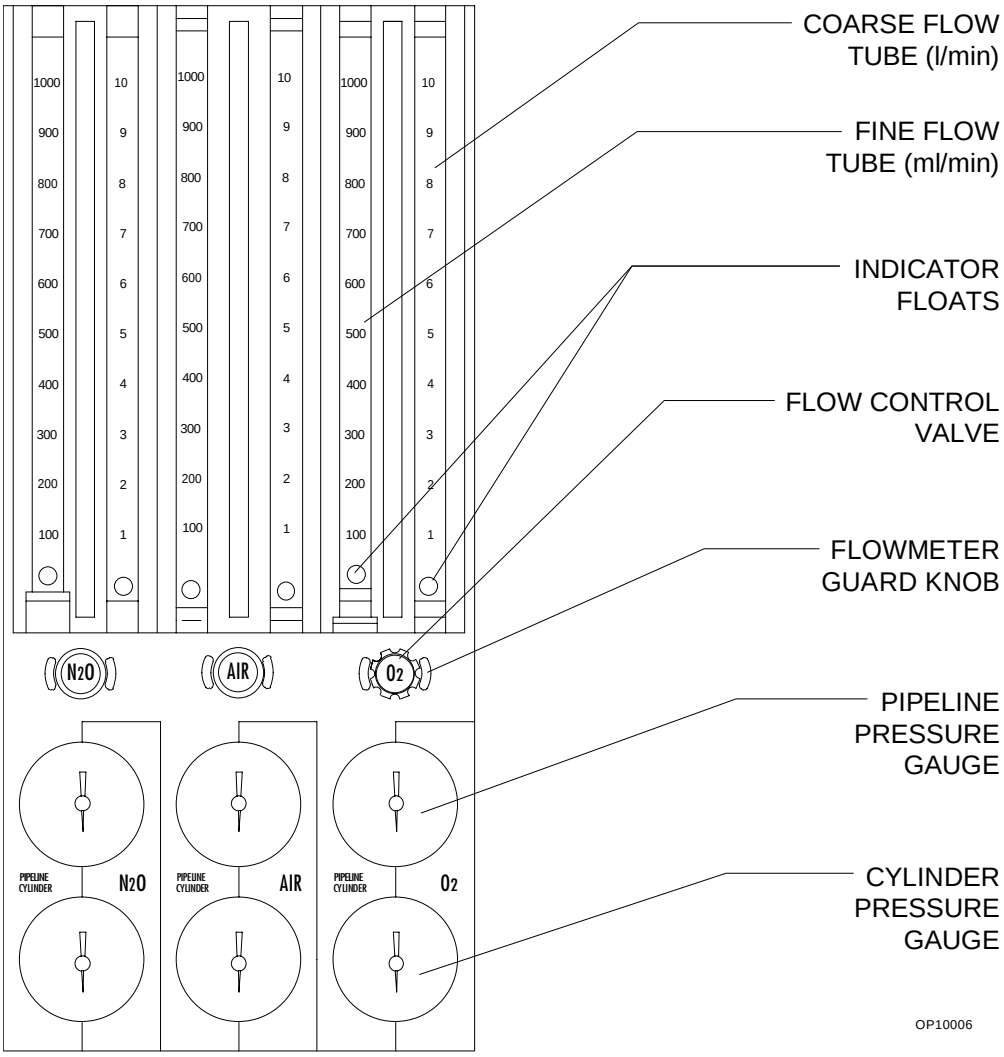
Gas Entry Via Pipeline

Gas from the hospital pipelines enters the Narkomed 4 through hoses connected to indexed pipeline inlets located on the side of the flowmeter housing. The indexed connector system reduces the risk of delivering the wrong gas to a patient by preventing incorrect connection of gas pipes. The inlets include check valves, which prevent back flow leakage into the atmosphere (when supply hoses are not connected) or into the attached supply hoses (when reserve cylinders are in use). Each pipeline connection is equipped with a filter to prevent foreign material from entering the internal gas piping of the Narkomed 4. Pipeline gases should be supplied at 50–55 psi.

Pipeline Pressure Gauges

The anesthesia machine includes pipeline pressure gauges for oxygen and nitrous oxide. On machines equipped with air, a pipeline pressure gauge for air is also included. The gauges are located directly below their corresponding flowmeters and flow control valves, and are labeled and color-coded for their respective gases. Concentric scales in psi and kPa indicate the pipeline supply pressure. A typical pressure gauge and flowmeter arrangement is shown in the following figure.

THREE-GAS FLOWMETER
AND PRESSURE GAUGE ASSEMBLY



When the machine is connected to an active pipeline supply, each gauge should indicate 50–55 psi. A deviation from within this range indicates that the pipeline gas supply system is improperly adjusted and may adversely affect the operation of the Narkomed 4. A fluctuating pipeline supply pressure, for example, would cause a corresponding fluctuation of the flow of gas delivered from that pipeline. An excessively low pipeline pressure may activate the corresponding reserve cylinder and deplete its contents (if the reserve cylinder valve was left in the open position).

CAUTION: To ensure that gas supplies are at adequate pressure, pipeline pressure gauges should indicate steady pressures of 50–55 psi.

Section 2
General Description

Gas Entry Via Cylinder Yokes

The Narkomed 4 can be equipped with a maximum of two oxygen and two nitrous oxide cylinder hanger yokes. An additional yoke for an optional third gas is also available. To prevent a cylinder from being improperly connected, the yokes are labeled, color-coded, and keyed for gas-specific cylinders using the pin-indexed safety system.

A filter within each yoke prevents foreign material from entering the internal gas piping of the Narkomed 4. A check valve in each yoke prevents leakage into the atmosphere if the cylinder is not mounted on the yoke. When the machine is configured with two yokes for the same gas, the check valve prevents movement of gas from one cylinder to the other. If a cylinder is not mounted to a yoke, the attached yoke plug should be placed between the yoke handle's threaded bolt and the yoke's gas inlet.

WARNING: Check cylinder yokes for the presence of two index pins each time you attach a cylinder to the machine. Use only one cylinder gasket per yoke; using more than one gasket could cause leakage of the cylinder gas and compromise the pin-indexed safety system.

Cylinders attached to the hanger yokes must contain gas at the recommended pressures outlined in the table below. (Indicated pressures are of E-size cylinders at 70°F, or 21°C.) Cylinders measuring less than the minimum recommended pressure (PSI - MIN) should be replaced with new, full cylinders.

GAS	PSI - FULL*	PSI - MIN
Air	1900	1000
Carbon Dioxide	838	600
Nitrous Oxide	745	600
Oxygen	1900	1000

* typical full load

Cylinder Pressure Gauges

Each cylinder gas circuit has a cylinder pressure gauge, located at the bottom of the flowmeter panel on the front of the machine (see the Flowmeter and Pressure Gauge Assembly figure earlier in this section.) Each gauge is labeled and color-coded for its respective gas. When a cylinder's valve is open, its pressure gauge indicates the gas pressure in the cylinder. The dial is marked with concentric scales for psi and kPa. If two reserve cylinders of the same gas are open at the same time, the gauge indicates the pressure in the cylinder having the higher pressure.

For nonliquefied gases (oxygen, air), the indicated pressure is proportional to the gas content of the cylinder. For liquefied gases (nitrous oxide, carbon dioxide), the gauge indicates the vapor pressure of the liquefied gas in the cylinder. This pressure remains constant until all of the liquid in the cylinder has vaporized. When the liquid has vaporized, the cylinder pressure decreases proportionally as gas is removed from the cylinder.

Oxygen Supply Pressure Failure Protection Device (OFPD)

An oxygen failure protection device (OFPD) is a pneumatically operated valve that protects the patient in the event of partial or complete loss of oxygen pressure. Each gas circuit in the anesthesia machine, except the oxygen circuit, is controlled by one of these valves. These valves, in turn, are controlled by the gas pressure in the oxygen supply line. When oxygen pressure is adequate, the valves remain open for an unrestricted gas flow. Loss of oxygen pressure causes the valves to close to a degree that is proportional to the loss. The result is a restriction or shut down of the flow of all gases except oxygen.

Reductions of gas flow are indicated on the flowmeters. In addition, if the oxygen supply pressure drops below approximately 37 psi, an oxygen supply pressure alarm is activated, causing the following events to occur:

- The Caution message O_2 SUPPLY LOW appears on the alarm display.
- The red O_2 SUPPLY PRESSURE indicator on the main switch panel lights.
- An intermittent audible alarm sounds.
- A 7-second whistle may sound, depending on the machine's configuration.

NOTE: When one source of oxygen pressure (either pipeline or reserve cylinders) fails, but the other source is able to maintain proper pressure within the machine's oxygen supply lines, the oxygen supply pressure alarm is not activated.

Section 2
General Description

Flowmeters

Flowmeters, located directly above their corresponding flow control valves, display the delivered flow rate of each gas in the fresh gas mixture. Dual flowmeter tubes (fine and coarse) are used in tandem for oxygen, nitrous oxide, and air (if provided). When other gases are supplied, single flowmeter tubes are used. All flowmeters are labeled at each end of the flowtube. A typical flowmeter arrangement is shown in the Flowmeter and Pressure Gauge Assembly figure earlier in this section.

Each flowmeter has a float indicator. To determine the flow rate, read the flowmeter scale at the center of the float.

Low-Flow Flowmeters (Optional)

For low-flow anesthesia, the Narkomed 4 can be configured with low-flow, dual-tube flowmeters for oxygen and nitrous oxide. These flowmeters function the same way as the standard dual-tube flowmeters, but they are calibrated to provide greater resolution for low-flow anesthesia.

Minimum Oxygen Flow

The oxygen dispensing system incorporates a calibrated bypass flow of 150 ±50 ml/min (at 50 psi pipeline pressure), which delivers this volume of oxygen even if the oxygen flow control valve is fully closed.

Flow Control Valves

A needle valve is located below the fine flowmeter tube for each gas. This valve is used to adjust the flow of gas. Turning the valve knob counterclockwise increases flow; turning the knob clockwise decreases flow. A zero stop prevents damage to the flow control valve seats. If necessary, a North American Dräger qualified technical service representative can readjust the stop.

Each flow control knob is identified by its color code and chemical symbol. The oxygen flow control valve is also touch-coded with a deeply fluted knob.

CAUTION: The flow of oxygen cannot be completely shut off (see “Minimum Oxygen Flow” earlier in this section). Do not force the oxygen flow control knob in an effort to shut off the minimum flow; forcing the knob can damage the valve seat.

Oxygen Flush

A manually operated, self-closing oxygen flush valve is located on the front of the machine. A bezel is mounted around the pushbutton in order to prevent accidental engagement. The valve, when actuated, delivers an unmetered oxygen flow of approximately 55 l/min directly to the Narkomed 4's fresh gas common outlet. The SYSTEM POWER switch does not have to be in the ON position to use the oxygen flush.

Oxygen Ratio Controller (ORC)

The ORC is a pneumatic oxygen/nitrous oxide interlock system. It maintains a fresh gas oxygen concentration of 25 ±4% and permits independent control of the oxygen and nitrous oxide flows.

The ORC proportionally limits the nitrous oxide flow whenever the selected oxygen and nitrous oxide flow control valve settings would otherwise result in a hypoxic fresh gas mixture. For example, if you open the nitrous oxide flow control valve excessively without making a corresponding increase in the oxygen flow control valve setting, the flow of nitrous oxide will not increase even though its flow control valve setting has been greatly increased. Similarly, if you decrease the oxygen flow without also decreasing the nitrous oxide flow, the nitrous oxide flow will automatically drop in proportion to the oxygen flow.

WARNING: In circle systems the gas mixture in the patient circuit is not necessarily the same as that in the fresh gas flow. This is particularly true at low fresh gas flow rates when the patient rebreathes a significant portion of previously exhaled gases. It is important that the gas mixture in the patient circuit be monitored, and that the fresh gas flow be adjusted to meet the requirements of the patient as well as to compensate for any patient uptake, system leakage, or gas withdrawn through sample lines and not returned.

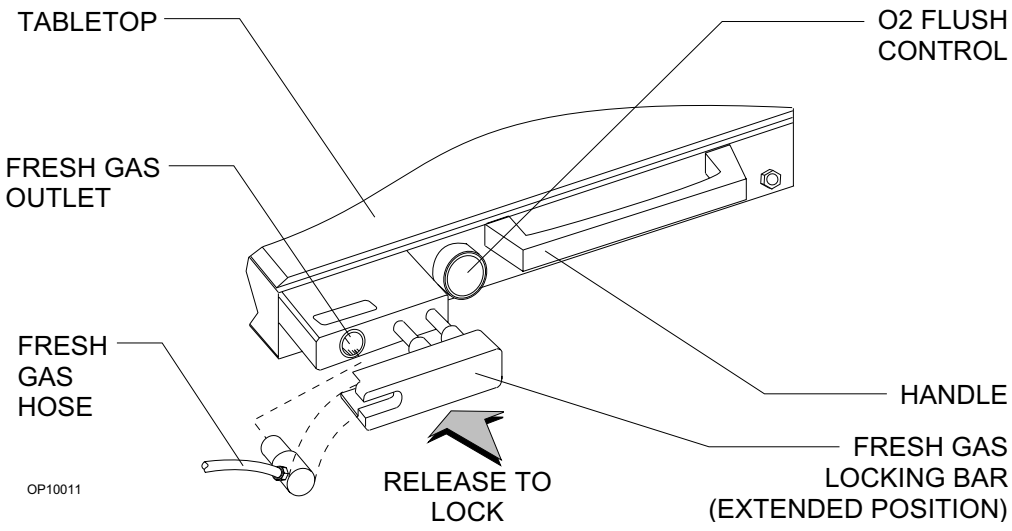
WARNING: The ORC interlocks only the flows of oxygen and nitrous oxide. Hypoxic fresh gas concentrations are possible if carbon dioxide is used as an additional gas.

Section 2
General Description

Fresh Gas Outlet

The fresh gas outlet delivers the fresh gas mixture (consisting of oxygen, nitrous oxide, optional gases, and vapors of a liquid anesthetic) to the patient breathing system. It is located on the front of the anesthesia machine.

The outlet's 15 mm cylindrical female fitting is designed to accept the 15 mm male fitting on the absorber fresh gas hose. The male fitting slides into a retaining slot in the spring-loaded safety locking bar to prevent inadvertent disconnection of the fresh gas hose. The 15 mm male fitting on the fresh gas hose is unique to North American Dräger design, and cannot be replaced by a hose from any other manufacturer.

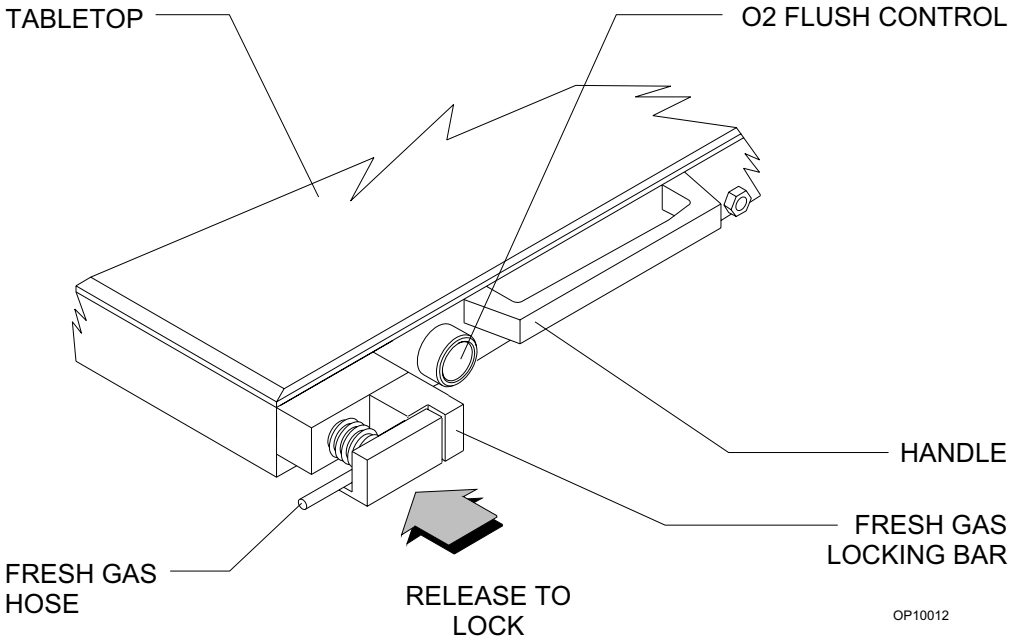


Fresh Gas Outlet (Canada)

The fresh gas outlet delivers the fresh gas mixture (consisting of oxygen, nitrous oxide, optional gases, and vapors of a liquid anesthetic) to the patient breathing system. It is located on the front of the anesthesia machine.

The fresh gas outlet has a dual fitting that lets you use a gas hose with either of the following types of fittings:

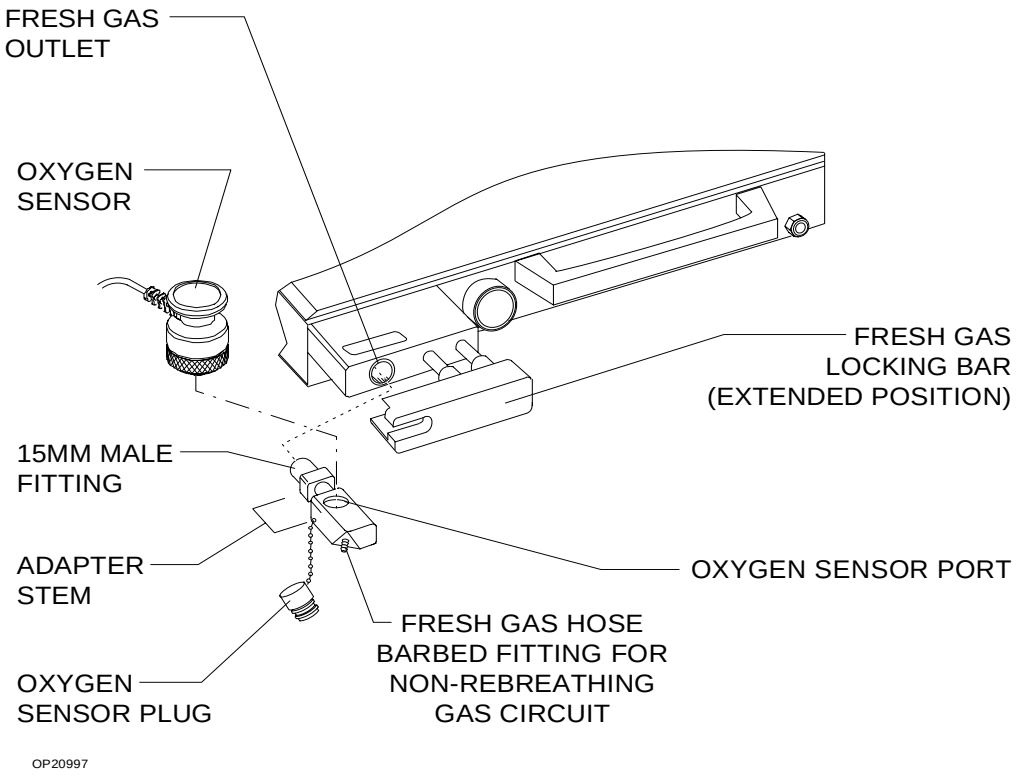
- A 15 mm male fitting, such as those supplied with North American Dräger absorbers and Bain circuit adapters. When using a 15 mm fitting, place the spring-loaded locking bar over the male fitting to secure it to the female fitting.
- A 22 mm female fitting with a load-bearing threaded mount, such as those for Magill circuits or ISO-type non-rebreathing adapters. When using an ISO-type non-rebreathing adapter, swing the spring-loaded locking bar to the side to gain access to the threaded load-bearing fitting.



Section 2
General Description

Fresh Gas Oxygen Sensor Adapter

The optional fresh gas adapter allows the Narkomed 4 to monitor the fresh gas oxygen concentration when using a nonrebreathing circuit (other than a Bain circuit). The fresh gas adapter fits securely into the fresh gas outlet of the anesthesia machine. It incorporates a port for an oxygen analyzer sensor and a fitting for a non-rebreathing circuit.



WARNING: The fresh gas oxygen sensor adapter measures the fresh gas oxygen concentration, not the inspiratory oxygen concentration. Depending on the fresh gas flow and the respiratory minute volume, the inspiratory oxygen concentration may be lower than fresh gas oxygen concentration due to rebreathing of previously exhaled gases.

Auxiliary Oxygen Flowmeter (Optional)

For the delivery of a metered flow of pure oxygen (for example, delivery of oxygen through a nasal cannula), an optional auxiliary oxygen flowmeter can be mounted on the left side of the flowmeter bank. This flowmeter can be used when the machine is turned off. A zero stop prevents damage to the flow control valve seat.

Vaporizers

The Narkomed 4 can be equipped with up to three Vapor 19.1 vaporizers for administering liquid anesthetics.

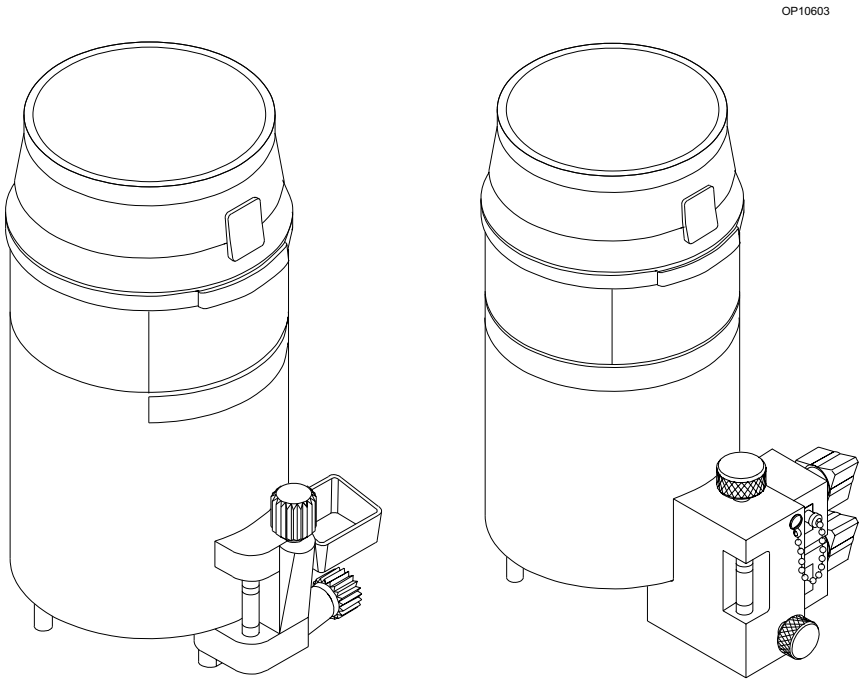
Exclusion System

An interlock system, incorporated into the vaporizer bank, prevents more than one vaporizer from being activated at a time. The interlock system requires all unused vaporizers to be locked in their zero volume percent positions.

WARNING: Only one vaporizer can be activated at a time. If the exclusion system permits simultaneous activation of more than one vaporizer, do not use the anesthesia machine. Contact a North American Dräger qualified technical service representative for adjustment.

Filling Systems

Two filling systems are available for the Vapor 19.1 vaporizer: the open funnel system and the key-indexed safety system.



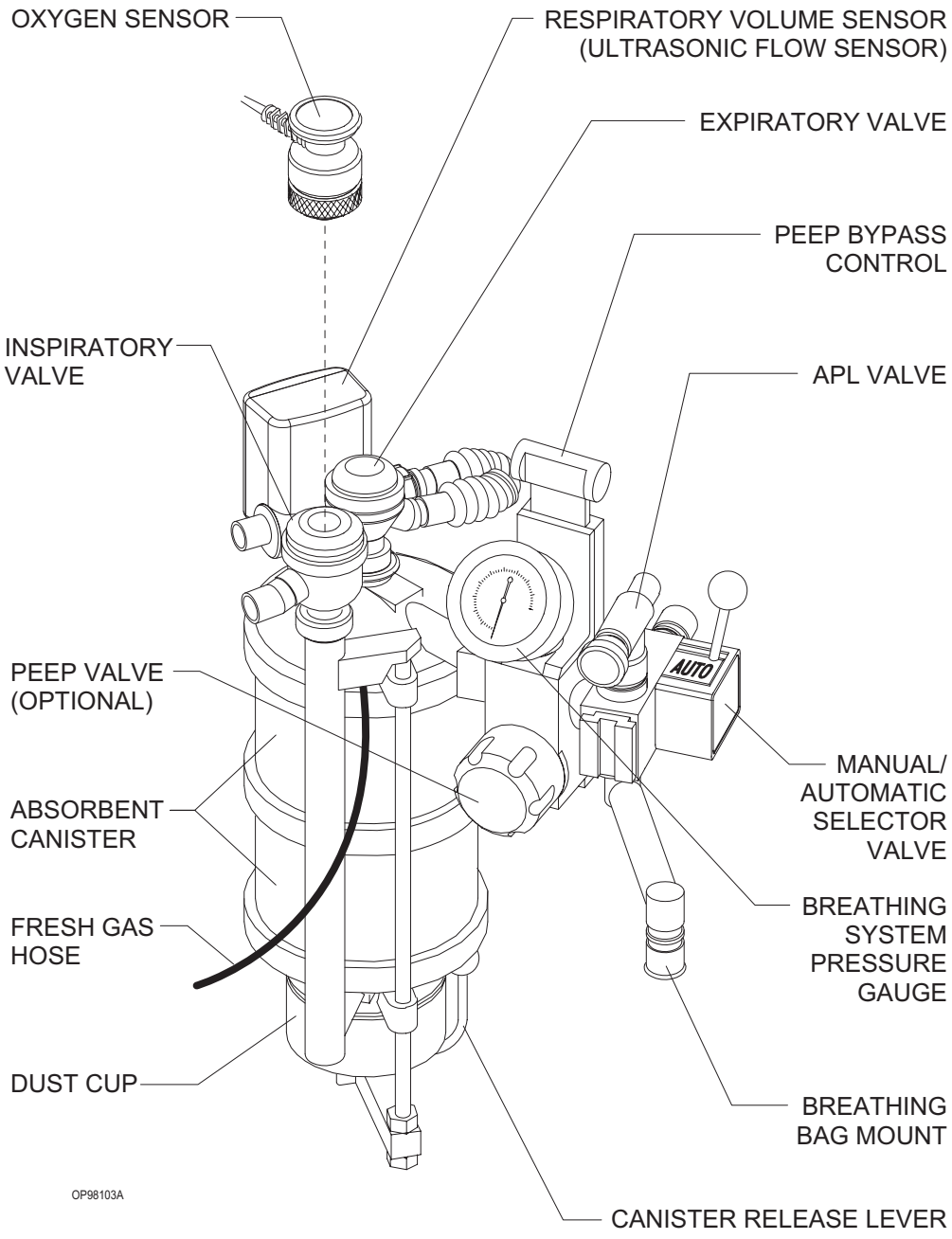
OPEN FUNNEL FILLER

KEY INDEXED
SAFETY SYSTEM

Section 2
General Description

Absorber

The absorber is a dual-canister system for absorbing exhaled carbon dioxide in the rebreathing circuit of the anesthesia machine. It incorporates an adjustable pressure limiter (APL) valve, a breathing system pressure gauge, a fresh gas line, and connections for sensing the following: breathing pressure, respiratory volume, frequency, and oxygen concentration.



The absorber system permits spontaneous, manually assisted, or automatic ventilation of the patient. The absorber incorporates a manual/automatic selector valve, which allows you to select either manual or automatic ventilation. An absorber with a positive end expiratory pressure (PEEP) valve is also available.

WARNING: Waste gas scavenging systems used with North American Dräger absorber systems must have safety features to ensure that excessive subatmospheric pressure (lower than -0.5 cmH_2O) and excessive positive pressure (higher than +0.5 cmH_2O) are not possible at the connection point.

Inspiratory and Expiratory Valves

The inspiratory and expiratory valves, labeled INSPIRATION and EXPIRATION, respectively, control the direction of gas flow in the absorber system. The valves are unidirectional, meaning that they permit gas to flow in one direction only.

- The inspiratory valve allows gas to flow toward the patient only, with no backflow to the absorber.
- The expiratory valve allows gas to flow to the absorber only, with no backflow to the patient.

The valves are *not* interchangeable. They must be connected to the correct mounts (inspiratory valve to inspiratory mount, expiratory valve to expiratory mount) to ensure the proper flow direction through the absorber system. Different size mounting threads on each valve prevent connection of a valve to the wrong mount.

WARNING: Do not use the inspiratory or expiratory valve if any one of these problems occurs:

- A pin in the valve body or plastic valve dome is bent, damaged, or missing.
- The valve disk is missing or damaged.
- The valve seat is damaged.

Section 2
General Description

Canisters

Each absorber unit contains two interchangeable transparent plastic canisters which house the absorbent. The absorbent, soda lime or barium hydroxide lime, can be purchased in either loose granular or prepacked cartridge form.

Dust Cup

A removable, transparent plastic cup below the bottom assembly collects absorbent dust and excess moisture which could cause increased flow resistance in the system.

Breathing System Pressure Gauge

The absorber system is equipped with a pressure gauge to enable quick visual determination of breathing circuit pressure. The gauge is marked for measurements from -20 to +80 cmH_2O in increments of 2 cmH_2O.

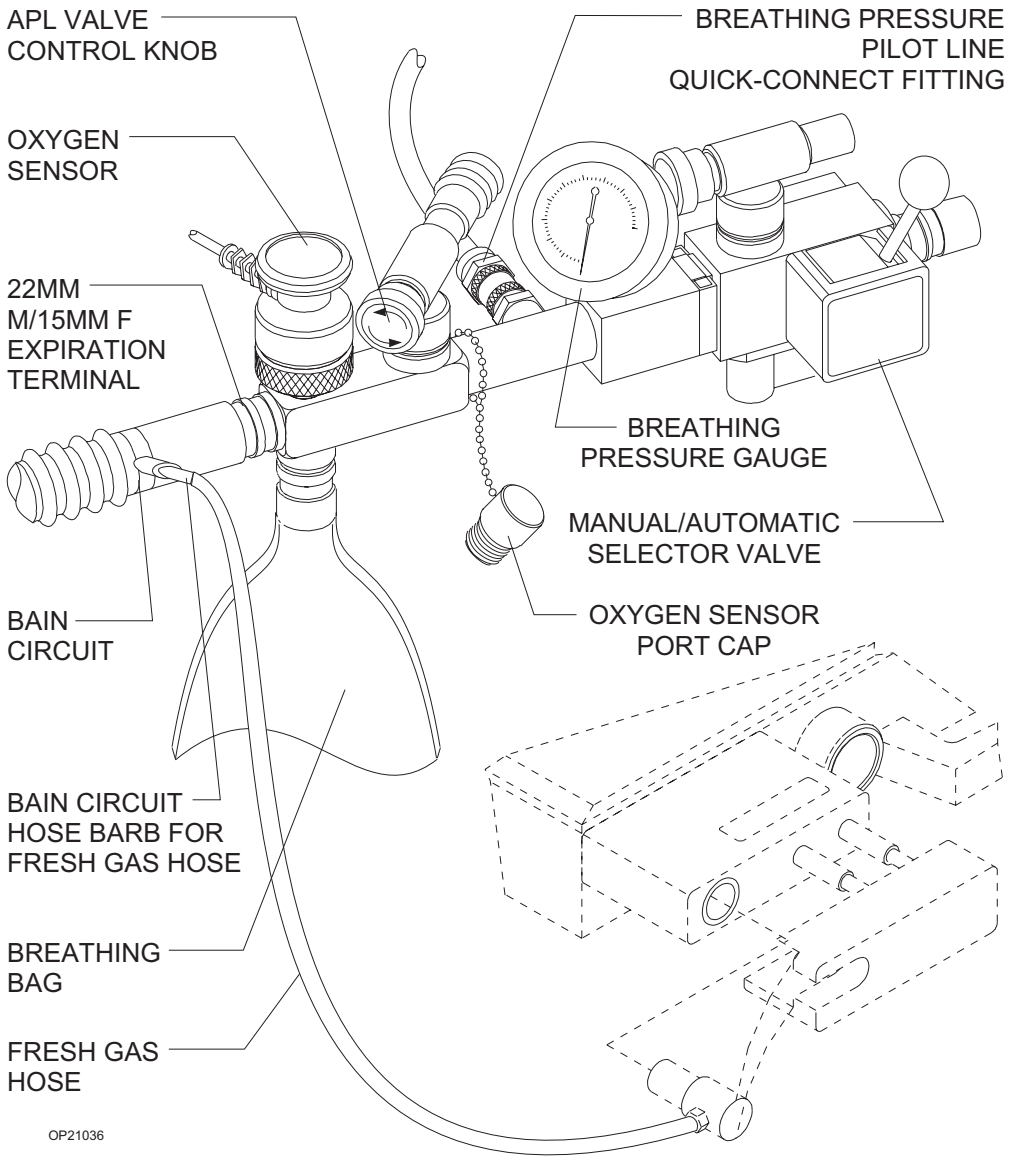
WARNING: Frequent observation of the breathing system pressure gauge is mandatory to ensure adequate pressure buildup and relief, regardless of the mode of operation.

Bain Circuit Adapters

Two types of Bain circuit adapters are available. One mounts to the absorber; the other mounts to the absorber pole.

Absorber Mount

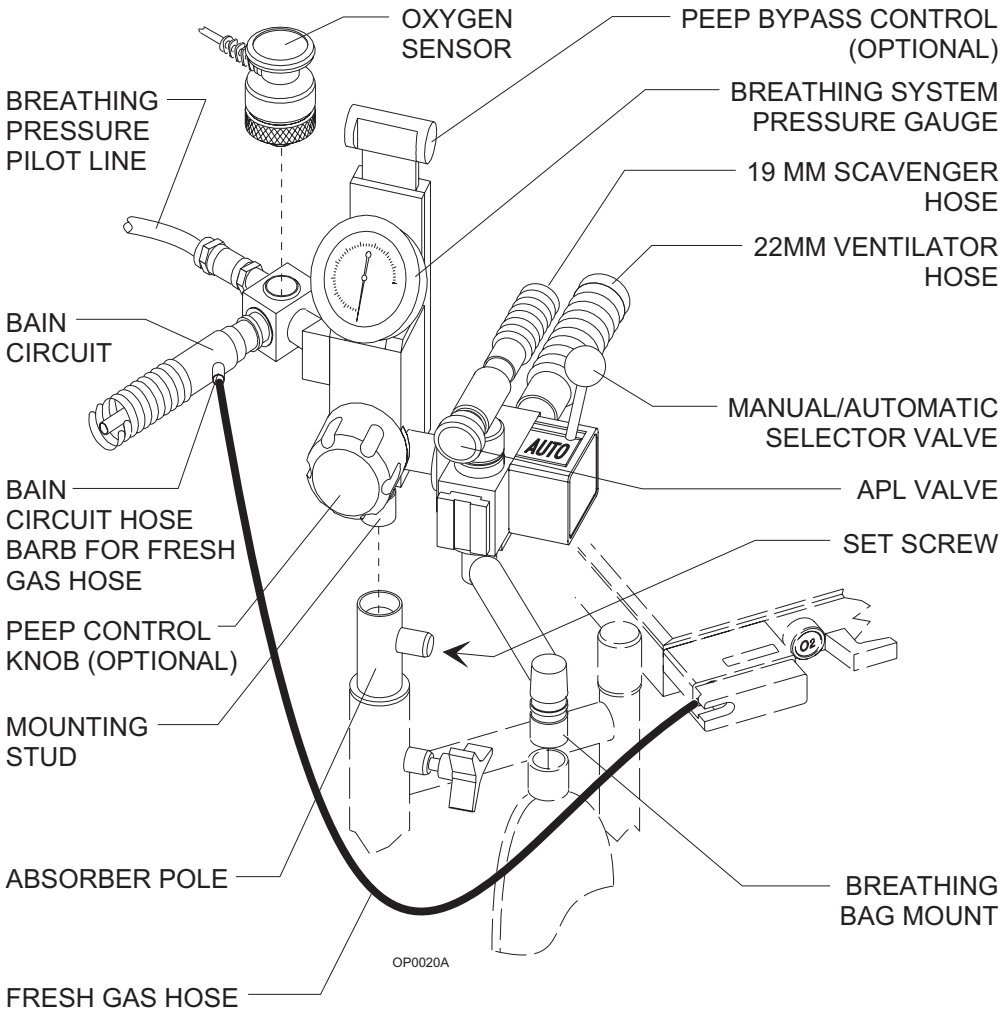
The absorber-mounted Bain circuit adapter, shown in the following illustration, mounts onto the manual/automatic selector valve of the absorber system. The adapter includes an adjustable pressure limiter (APL) valve, a breathing pressure gauge, a quick-connect fitting for the breathing pressure pilot line, a port for the oxygen sensor, a 15/22 mm port for non-rebreathing circuits, and a connector for a patient breathing bag.



Section 2
General Description

Pole Mount

The pole-mounted Bain circuit adapter, shown in the following illustration, mounts on the absorber pole. It may be supplied with or without a positive end-expiratory pressure (PEEP) valve.

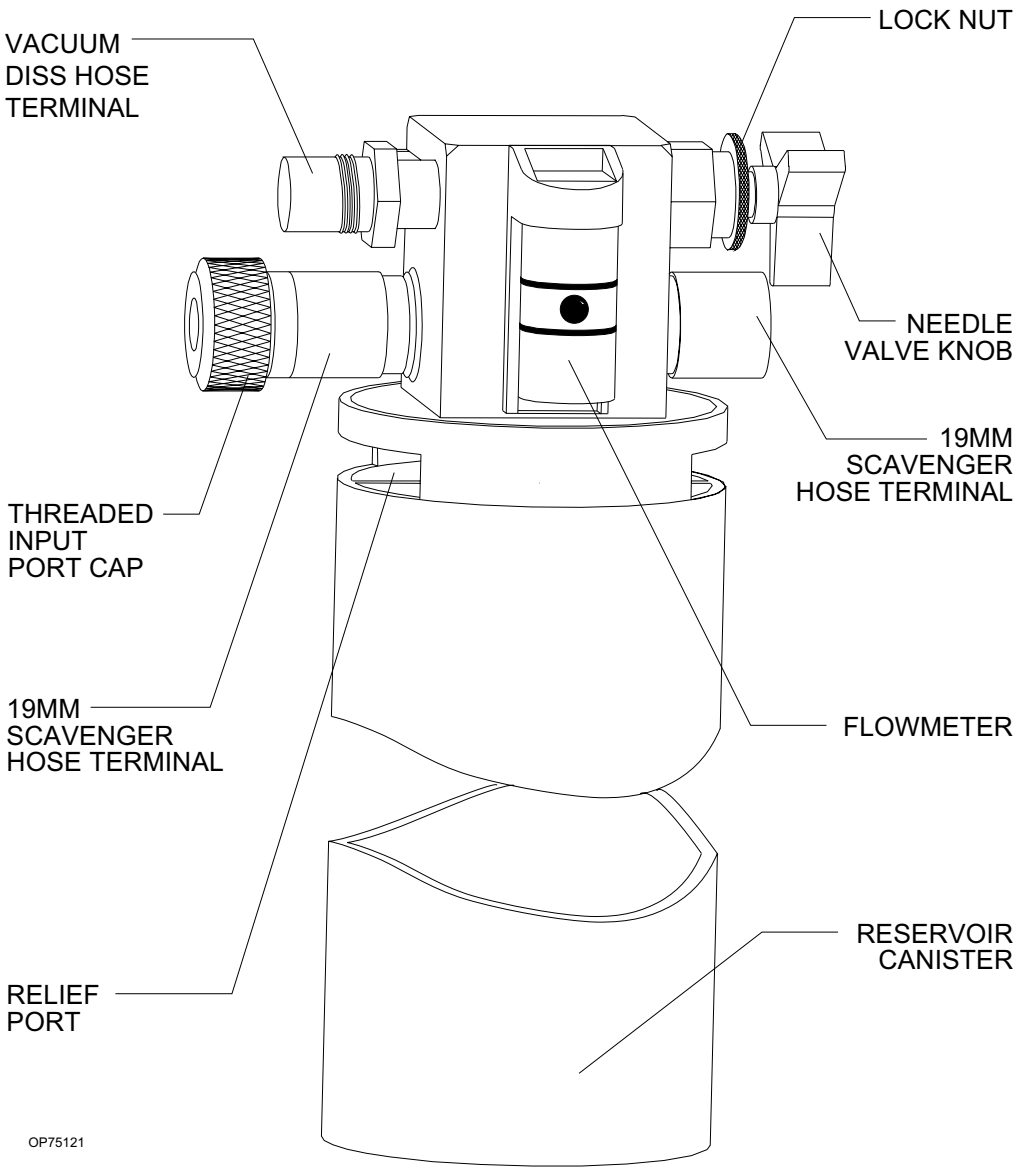


Scavenger Systems

The Narkomed 4 can be equipped with one of two kinds of scavenger systems, permitting the best match with the hospital's waste gas disposal system.

Open Reservoir Scavenger

The open reservoir scavenger is used with suction (vacuum) waste gas disposal systems. This scavenger is an "open" system, featuring continually open relief ports to provide positive and negative pressure relief.

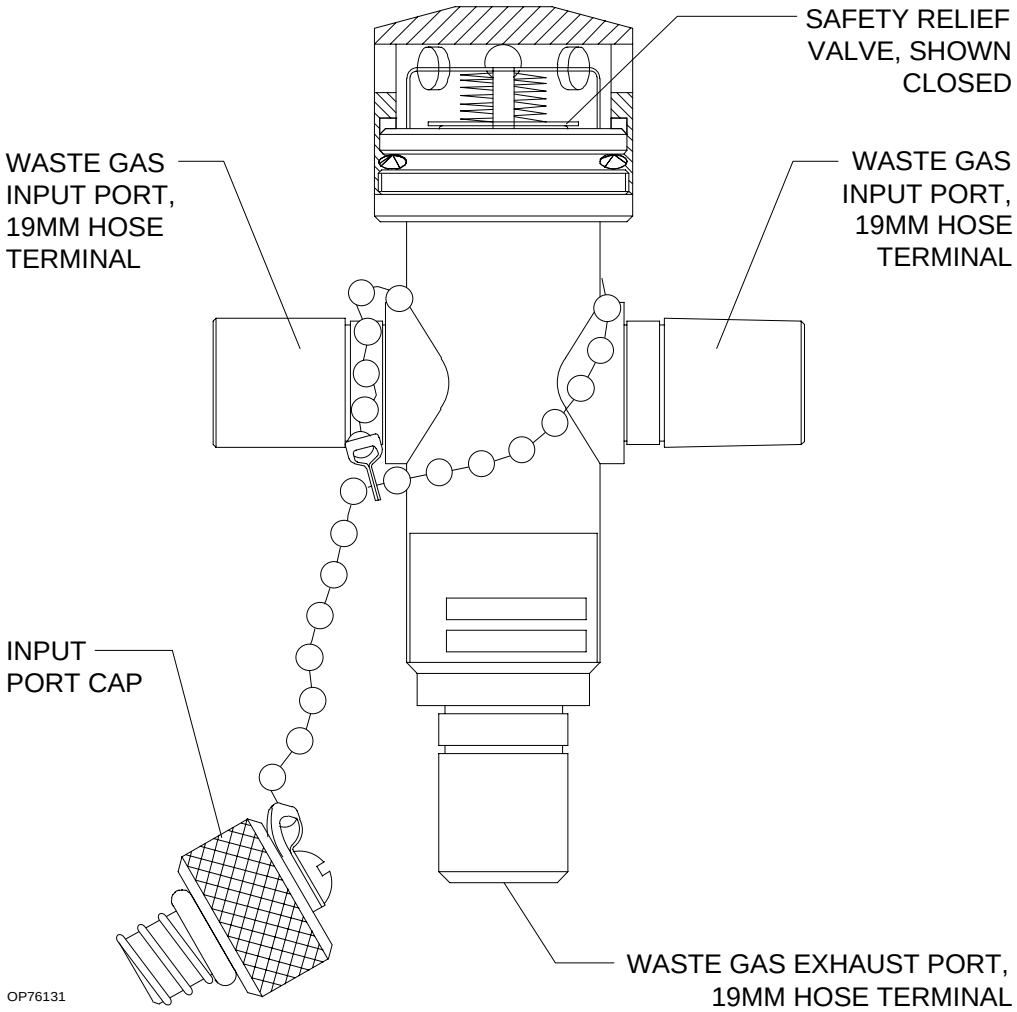


Section 2
General Description

Scavenger Interface for Passive Systems

The scavenger interface for passive systems is used with nonrecirculating HVAC systems (also called exhaust systems). This scavenger is a “closed” system, using a spring-loaded valve for positive pressure relief.

WARNING: Do not use this device with a waste gas disposal system capable of applying a negative pressure to the scavenger interface (a suction or vacuum waste gas disposal system).


SAFETY RELIEF VALVE, SHOWN CLOSED
WASTE GAS INPUT PORT, 19MM HOSE TERMINAL
WASTE GAS INPUT PORT, 19MM HOSE TERMINAL
INPUT PORT CAP
WASTE GAS EXHAUST PORT, 19MM HOSE TERMINAL
OP76131

AV2+ Ventilator

The AV2+ anesthesia ventilator is a volume preset, time cycled, pressure limited ventilator with electronic timing, pneumatic circuitry and independent controls for frequency, inspiratory to expiratory (I:E) ratio, inspiratory flow rate, tidal volume, and inspiratory pressure limiting.

Pneumatic power (bellows drive gas) to the ventilator is supplied through the hospital pipeline supply or through reserve cylinders on the anesthesia machine. The pressure of the supply gas must be between 40 and 60 psi. The ventilator will not function properly if this pressure drops below 32 psi. Electrical power is supplied by the Narkomed 4's AC power source, or, in event of AC power failure, by the backup battery. A fully charged battery can power the ventilator for approximately 30 minutes.

The anesthesia ventilator is designed for use with a North American Dräger absorber system, which incorporates a manual/automatic selector valve. This valve allows you to select either the breathing bag and adjustable pressure limiter (APL) valve for manual ventilation, or the ventilator bellows for automatic ventilation.

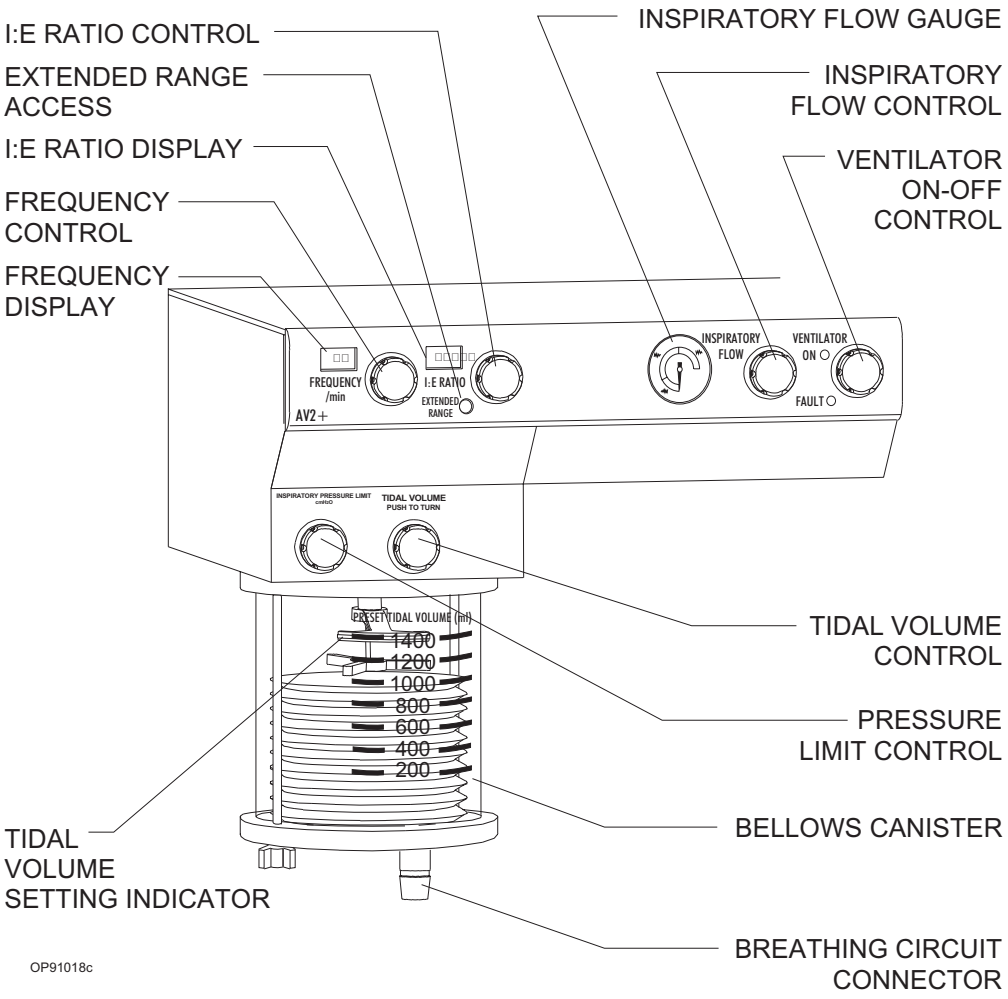
During automatic ventilation, the manual/automatic selector valve isolates the absorber's APL valve from the breathing system. To compensate for the continuous introduction of fresh gas into the breathing system, the ventilator incorporates a relief valve mounted behind the bellows chamber.

When the bellows is completely filled, any excess gas in the system is released to the scavenging system through the ventilator relief valve. As in any ascending bellows, the force needed to overcome gravity acting on the bellows causes a positive end-expiratory pressure (PEEP) within the breathing system. For the Narkomed 4, the PEEP is approximately 2 cmH_2O.

The pressure limit control allows you to set the peak inspiratory pressure produced by the ventilator in order to help prevent barotrauma. The pressure limit control can also improve ventilation for patients with reduced lung compliance (neonatal/pediatric patients and patients with adult respiratory distress syndrome) because it limits the peak inspiratory pressure during the inspiratory phase of ventilation.

The AV2+ ventilator is shown in the following drawing.

Section 2
General Description



Main Switch Panel

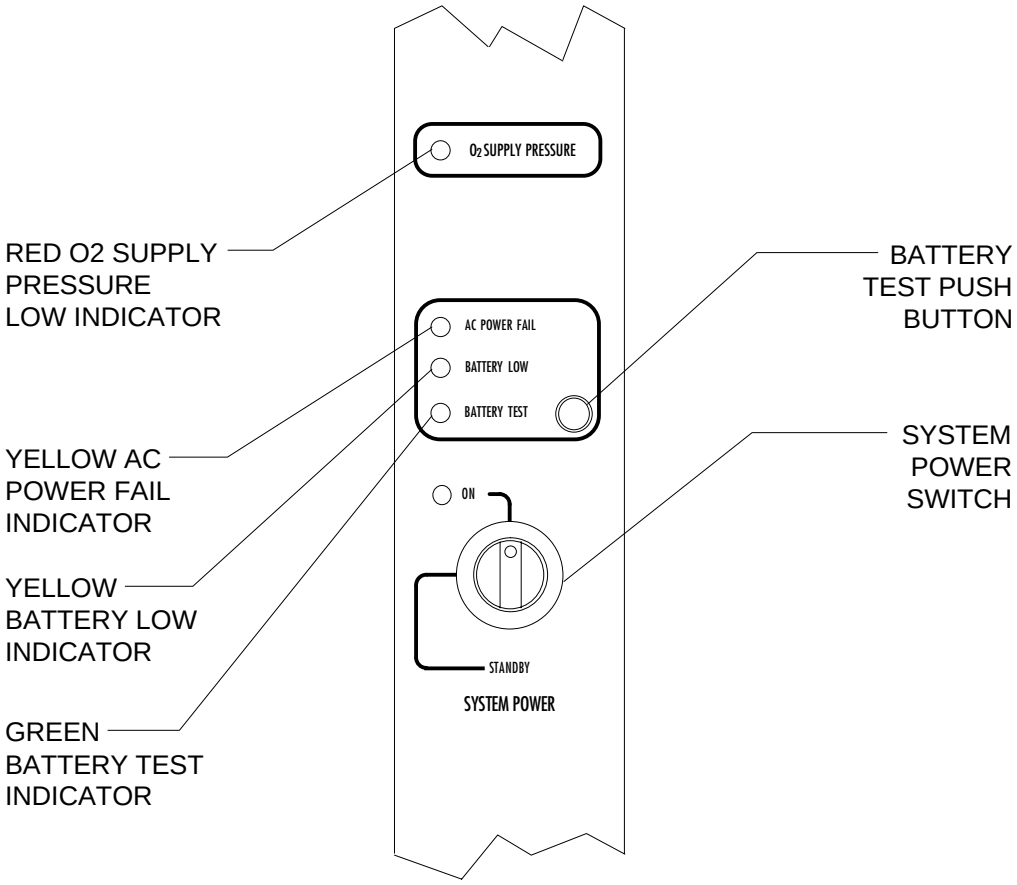
The main switch panel is located between the ventilator bellows and flowmeter bank.

System Power Switch

The SYSTEM POWER switch on the Narkomed 4 has two positions: ON and STANDBY. In the ON position, the gas (pneumatic) and electric power circuits are actuated, and the green LED indicator adjacent to the switch illuminates. In the STANDBY position, the switch shuts down the gas supplies, the monitoring system, and all electrical power to the machine except the convenience receptacles and battery charging circuit.

AC Power Failure Indicator

The yellow AC POWER FAIL LED signals a disruption of AC power. The LED is illuminated whenever the battery supplies power to the monitoring system and the electronic ventilator. A three-pulse tone also sounds every 30 seconds. If the anesthesia machine's backup battery is completely discharged, the AC power failure indicator does not have power and will not function.



Oxygen Supply Pressure Alarm

The oxygen supply pressure alarm is activated when the oxygen supply pressure in the system falls below approximately 37 psi. When the alarm is activated, the red O_2 SUPPLY PRESSURE indicator on the main switch panel lights. In addition, the Caution message O_2 SUPPLY LOW appears on the alarm display, and an intermittent audible alarm sounds. Depending on the anesthesia machine's configuration, a 7-second whistle may also sound.

NOTE: When one source of oxygen pressure (either pipeline or reserve cylinders) fails, but the other source is able to maintain proper pressure within the machine's oxygen supply lines, the oxygen supply pressure alarm is not activated.

Section 2
General Description

Power Supply System

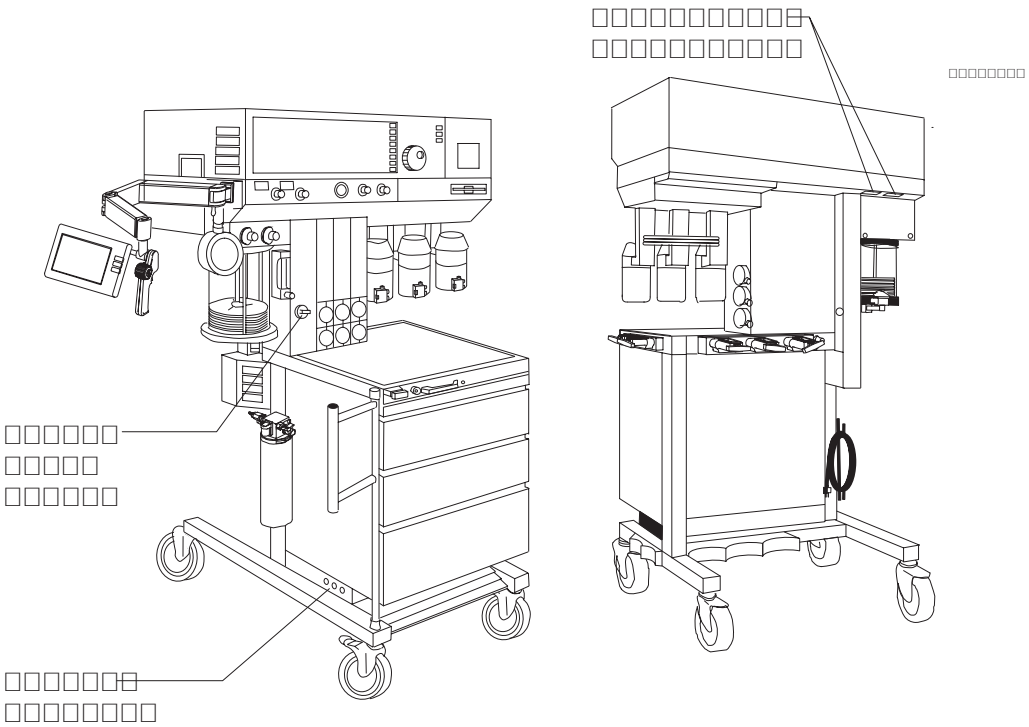
The Narkomed 4 is equipped with a central power supply for the ventilator, alarm system, and monitoring system. When in use, the Narkomed 4 must be plugged into an AC outlet.

Convenience Receptacles (117 Volt Power Supply only)

Narkomed 4 machines equipped with the 117 volt power supply have four convenience receptacles, mounted vertically on the upper rear of the machine. (Machines with the 240 VAC power supply option are not equipped with convenience receptacles.) The receptacles are active whenever the Narkomed 4 is plugged into an outlet, whether or not the machine is turned on.

The total current for devices plugged into the receptacles must not exceed 5 amps. A 5 amp circuit breaker protects the convenience receptacle circuit. This circuit also incorporates an EMI filter, which minimizes interference to the anesthesia machine from devices plugged into the convenience receptacles.

CAUTION: Devices plugged into the convenience receptacles contribute to the anesthesia system's total leakage current. The total leakage current (for system and external devices combined) must not exceed 100 microamps.



Circuit Breakers

The electrical system includes three magnetic circuit breakers to protect machine functions (primary AC power input, convenience receptacles, and backup battery power). The circuit breakers are located on the lower (absorber) side of the anesthesia machine.

When the plunger is flush with the surface of its base, the circuit breaker is in its normal, closed position. A circuit breaker is open (tripped) when its plunger extends beyond its base. If a breaker is tripped, the cause must be found and corrected before using the anesthesia system.

Backup Battery System

The backup battery system consists of a rechargeable battery and a built-in battery charging system.

Although most hospitals have emergency generators to supply AC power when line power fails, a delay may occur before generator power comes on-line. The backup battery system automatically provides power between the time that line power fails and the emergency power system is activated. The backup battery also provides power if the anesthesia machine's power cord is accidentally unplugged during a case.

When the hospital's emergency generator comes on-line (or when a disconnected power cord is reconnected), the Narkomed 4 automatically switches back to AC power and recharges its battery. The battery charging system charges the battery any time the power cord is connected to an active AC power source. The charger can recharge a fully discharged battery in approximately 12 hours.

If the machine is receiving AC power, but the battery voltage level is low due to a problem with the battery charging circuit or similar hardware malfunction, the Advisory message RESERVE BATT LOW appears on the alarm display.

Machine Functions on Backup Battery Power

If the hospital's primary AC power fails, the backup battery system is activated. This condition is indicated by the following alarms:

- The yellow AC POWER FAIL indicator on the anesthesia machine's alarm panel comes on.
- The Caution message AC POWER FAIL appears on the alarm display.
- A three-pulse pattern audio alarm sounds every 30 seconds.

If the battery is fully charged, all monitoring functions will continue to operate for approximately 30 minutes from the time these alarms are activated.

When the battery reserve approaches depletion following the AC power loss:

- The yellow BATTERY LOW main switch panel indicator illuminates.

  NOTE: The BATTERY LOW indicator will only illuminate during an AC power loss when battery reserves are low.

- The Caution message AC BATTERY FAIL appears on the alarm display.

These alarms signify that approximately 10 minutes of backup battery power remains.

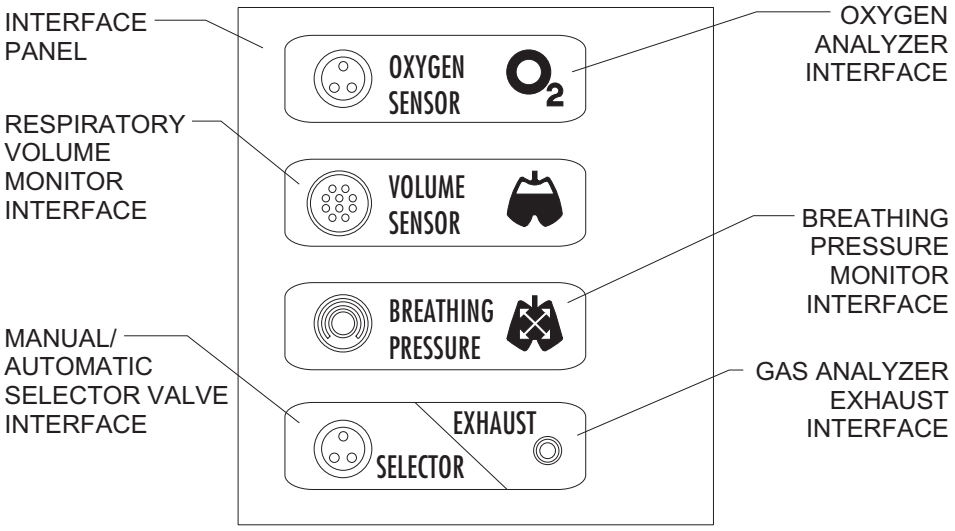
The gas supply system remains operative even after all electrical power is cut off. However, since the ventilator is inoperative when battery power is cut off, you must perform manual ventilation by bag. The machine cannot provide monitoring or alarm functions until AC power is restored.

NOTE: If the Narkomed 4's power cord is not plugged into an active AC outlet for a period of 7 days or more, the backup battery may become depleted. Plugging the power cord into an active AC outlet for approximately 12 hours will recharge a depleted battery.

System Interface Panel

The system interface panel, located on the left side of the machine below the ventilator bellows, contains interfaces for three monitor sensors: the oxygen analyzer, the respiratory volume sensor, and the breathing pressure pilot line.

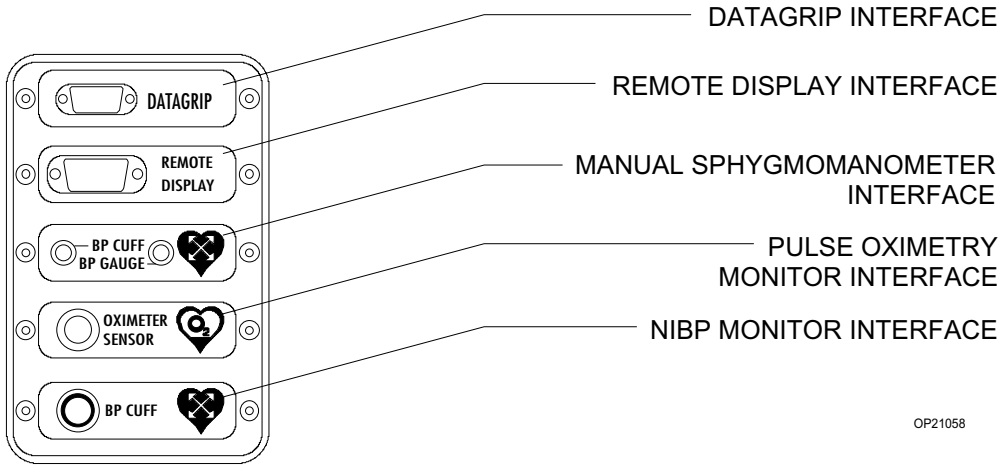
This panel also contains receptacles for the manual/automatic selector valve interface cable and for the gas analyzer exhaust line.



Patient Sensor Interface Panel

The patient sensor interface panel, located on the upper left side of the monitor housing, contains interfaces for three patient sensors: the manual sphygmomanometer blood pressure cuff and gauge, the pulse oximeter sensor, and the noninvasive blood pressure monitor pressure cuff.

The two upper ports on the panel are data ports for Datagrip® and the remote display.



Section 2
General Description

Monitoring System

The Narkomed 4's monitoring system integrates the functions of the electronic monitors and organizes and displays the information on three screens. Two display screens are integrated into the main monitor housing; the third, or remote, display is mounted on an adjustable display arm on the side of the machine.

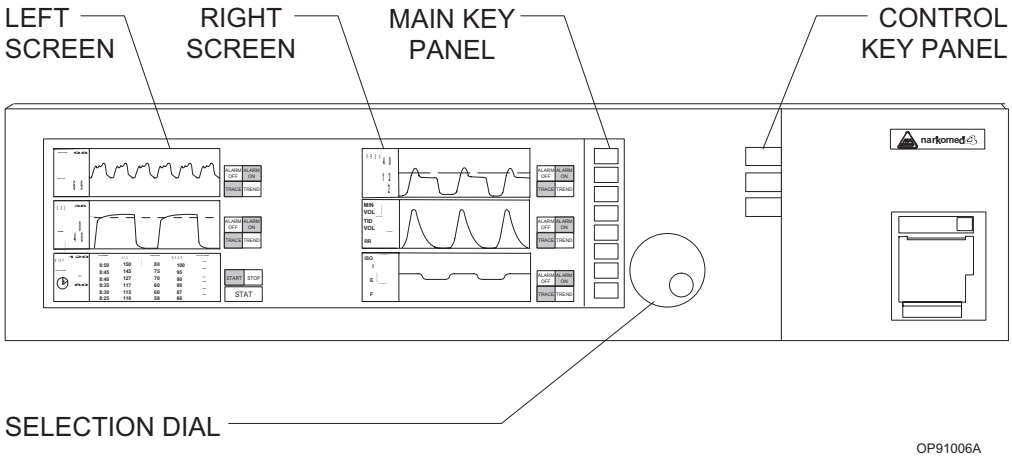
The Narkomed 4 monitors the following items:

- pulse oximetry
- respiratory gas (oxygen, carbon dioxide, nitrous oxide, and anesthetic agent)
- oxygen concentration
- breathing pressure
- respiratory volume
- noninvasive blood pressure (NIBP)

The anesthesia machine also monitors key anesthesia system functions such as oxygen supply pressure and backup battery status.

Main Display and Controls

Monitored items are shown on two screens comprising the main display. The display can be tilted up or down for optimal viewing.



MAIN DISPLAY (MONITOR SCREEN SHOWN)

Touch Keys

The main display screens have touch keys, which are touch-sensitive, button-like boxes that contain selections. To activate one of these keys, touch it, and the key becomes highlighted in the screen's amber color. Unselected keys are not highlighted.

Main Key Panel

The main key panel, located to the right of the display screens, is used to select the Narkomed 4's different screens. Each screen displays a specific type of information or allows you to make changes to settings and perform various functions. For complete information on each key, see "Operation, Monitoring System" in Section 5.

Control Key Panel

The control key panel is located on the upper right corner of both the main display and the remote display. It consists of three keys that perform system functions. A tone sounds each time one of these keys is pressed. For complete information on each key, see "Operation, Monitoring System" in Section 5.

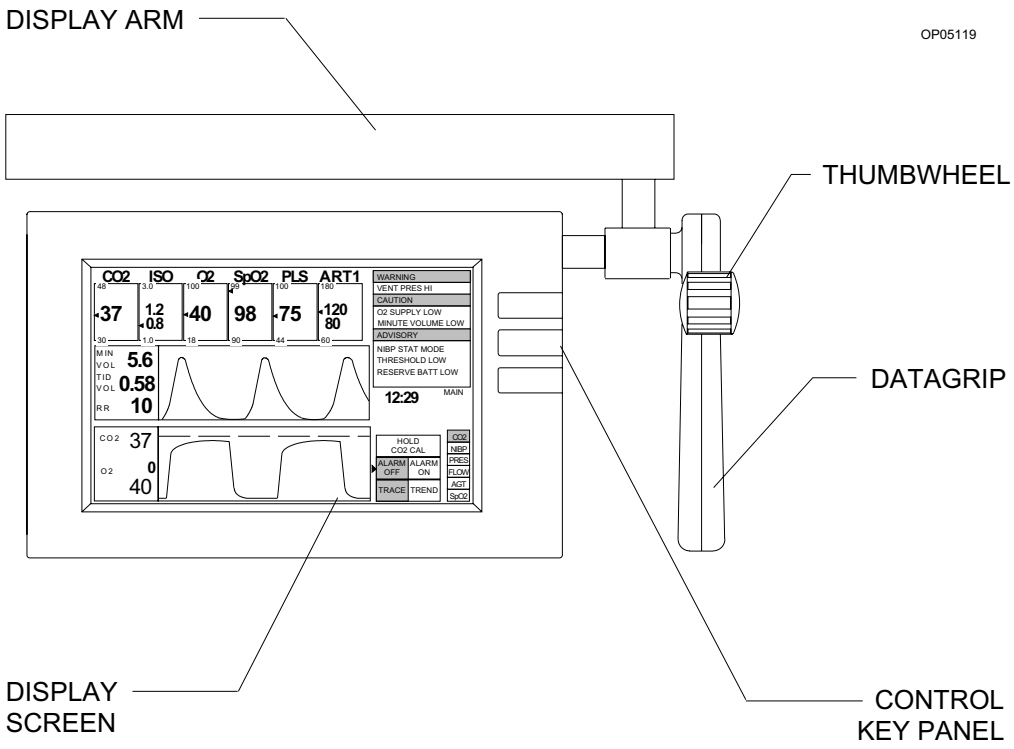
Selection Dial

The selection dial is located next to the main key panel. You can use the selection dial to scroll through menus or change variables, such as alarm limits, by turning the dial. Turning the dial clockwise increases a number, scrolls a log upward, and scrolls the cursor down through a menu. Turning the dial counterclockwise decreases a number, scrolls a log down, and scrolls the cursor up through a menu. Pressing the dial enters new values.

Section 2
General Description

Remote Display and Controls

The remote display, which is mounted on an adjustable display arm, shows all alarms and various types of monitoring information selectable by the user. If the Narkomed 4 is equipped with the optional O.R. Data Manager®, its various screens can also appear on the remote display.



Adjustable Display Arm

The adjustable display arm, mounted on the absorber side of the machine, supports the remote display and Datagrip. It also provides a means for routing patient sensor lines from the patient to the anesthesia machine in an organized manner. The arm can be adjusted up and down, side to side, as well as front to back, to place the display and sensor lines in the most convenient position. To adjust the arm in the front to back direction, pull and hold the release knob forward, move the arm to the desired position, and release the knob.

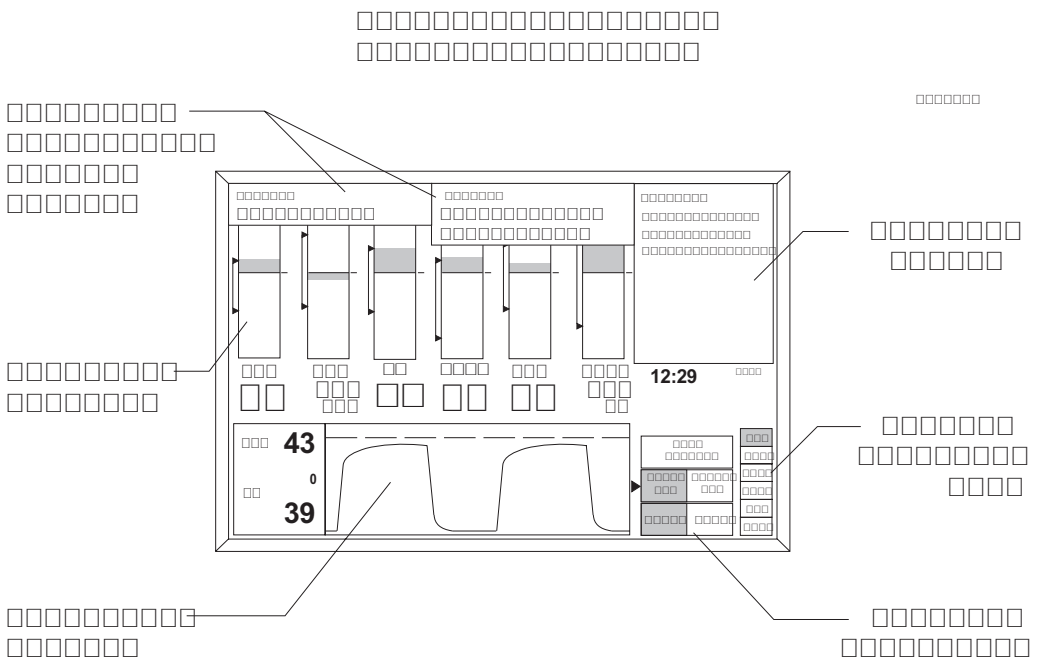
Datagrip

The Datagrip is a user input device attached to the side of the remote display. The Datagrip is composed of two mechanisms, a thumbwheel and a trigger, which are used to select and adjust parameters.

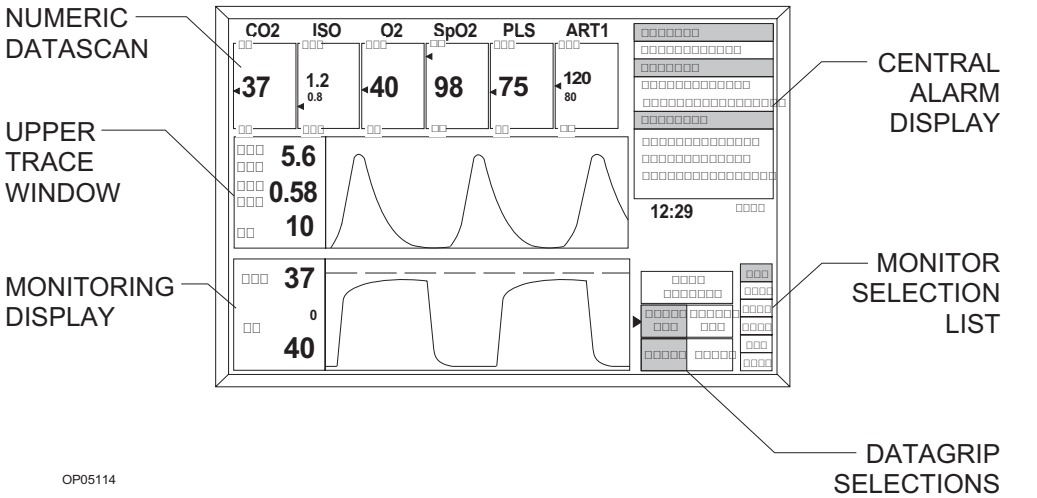
The trigger is used to select options. The thumbwheel, located at the top of the grip handle, is used to move the cursor on the screen and to scroll through the available monitoring screens.

Screen Display

The remote display screen can have one of two available display formats: the bar graph Datascan display or the numeric Datascan display. The two formats are shown in the illustrations below, and each part of the screen is described in detail in the following paragraphs.



REMOTE DISPLAY
WITH NUMERIC DATASCAN



Section 2
General Description

Datascan

The Datascan display format (bar graph or numeric) is selected by the user in the Remote Display Configuration screen (see Section 5, “Operation, Monitoring System”).

Bar Graph Datascan

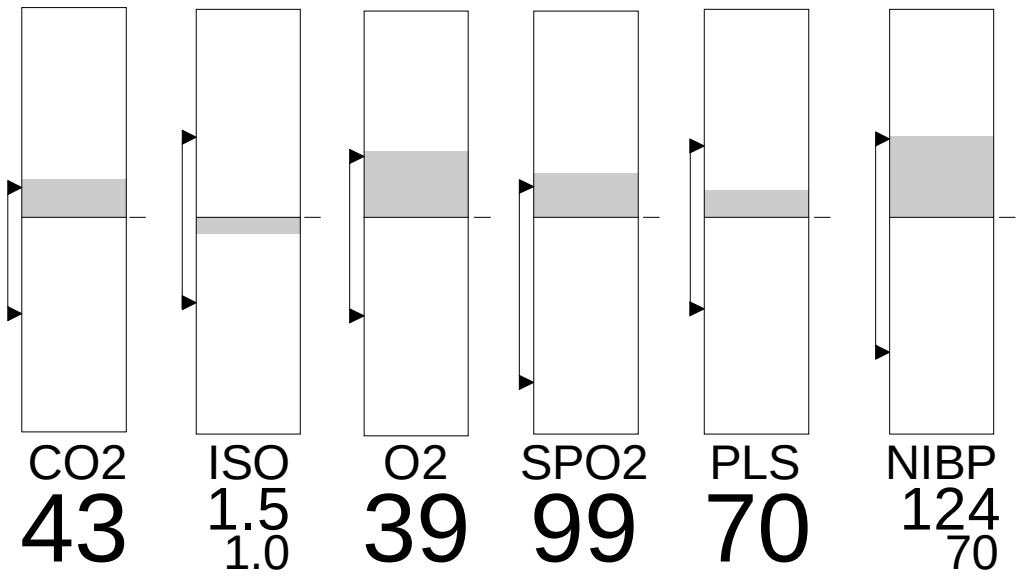
The bar graph Datascan consists of six bar graphs that appear at the top of the remote display. The bar graph Datascan allows you to see if any measurement deviates from a baseline. The display shows the following six bar graphs; if information for one or more bar graphs is not supplied, the corresponding display area is blank.

- End-tidal carbon dioxide
- Inspiratory/expiratory anesthetic agent
- Inspiratory oxygen concentration
- Oxygen saturation
- Pulse rate
- Systolic/diastolic blood pressure

NOTE: The inspiratory agent and the systolic pressure measurements are the larger size numerals below their respective bar graphs.

A baseline measurement setpoint appears at the midpoint of each bar graph, represented by a center line common to all six bar graphs. Pointers along the left side of each bar graph mark the high and low alarm limits. The current value for the measurement appears in numerical form under each bar graph.

OP27113



Any increase in a patient measurement causes the corresponding bar to rise from the center line. If any patient measurement decreases, its bar descends below the center line. Therefore, any deviation from the baseline, whether positive or negative, is immediately apparent.

To normalize the current measurements of the Narkomed 4, press the AUTOSET key on the control key panel. This sets the current measurements at the center line (baseline) and resets the endpoints.

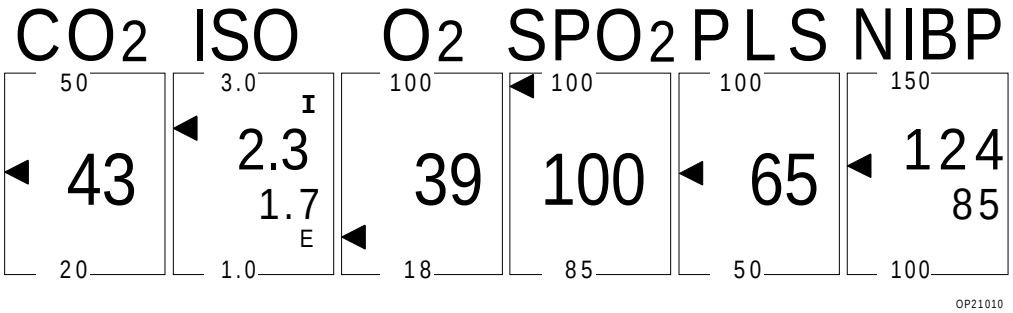
The endpoints of the bar graph boundaries represent values above and below the baseline that are determined by the scaling factor that you can configure in the Remote Display Configuration screen (see Section 5, “Operation, Monitoring System”).

Numeric Datascan

The numeric Datascan displays current values for all patient measurements and shows where those values are in relationship to the current alarm limits. The numeric Datascan consists of six rectangular display areas corresponding to the following six measurements. If information for one or more measurements is not supplied, the corresponding display area is blank.

- End-tidal carbon dioxide
- Inspiratory and expiratory anesthetic agent
- Inspiratory oxygen concentration
- Oxygen saturation
- Pulse rate
- Systolic and diastolic blood pressure

The current value for the measurement is shown in large numerics in the middle of each display area. The numbers at the top and bottom represent the current alarm limits for the measurement. The arrow on the left side of each display area shows where the current value lies within the boundaries of the alarm limits; this arrow will move up or down accordingly as the values change.



NOTE: The inspiratory agent and the systolic pressure measurements are the larger size numerals within their respective display areas.

To automatically adjust the alarm limits around the current values, press the AUTOSET key on the control key panel. This sets the alarm limits according to the deviation values specified in the Remote Display Configuration Screen. For complete information, see Section 5, "Operation, Monitoring System."

Upper Trace Window

The upper trace window can display trace information for five of the monitors shown on the main display. In addition, it can display ECG waveforms from externally connected Hewlett-Packard equipment. The upper trace display is selected in the Remote Display System Configuration Screen. For complete information, see Section 5, "Operation, Monitoring System."

Monitoring Display

The monitoring screen shown at the bottom of the remote display can be any one of the six monitoring screens comprising the main display. It shows the same numeric and trace/trend information as the main display monitor and can be selected by the user via the Datagrip.

Located next to the monitoring display are the corresponding Datagrip selections. A monitor selection list at the far right of the screen is used to select the monitor to be displayed. The remaining selections are specific to each monitor. A cursor, which is moved by turning the thumbwheel up or down, is used to scroll through the selections. The cursor does not wrap around.

Alarm System

Alarms are organized into three categories, depending on the urgency of the alarm condition.

Warnings The highest priority alarms requiring an immediate response

Cautions Second priority alarms requiring a prompt response

Advisories The lowest priority alarms requiring the operator's awareness

The Narkomed 4 provides both visual and audible notification of the most urgent conditions.

Alarm Display

The Narkomed 4 presents active alarms on the central alarm display located at the top of the remote display screen. Alarms are displayed either in a single window (if the numeric Datascan is selected) or in three separate windows that correspond to each alarm category (if the bar graph Datascan is selected).

Within each category, messages are listed in order of occurrence, with the most recent at the bottom of the list. If the number of alarms in a category exceeds the space provided for that category, additional alarm messages are retained in memory until space is available (that is, when displayed alarm conditions are resolved).

NOTE: The last space at the bottom of the Advisories category in the central alarm display is reserved for the SILENCE message. The SILENCE message indicates the time remaining in the Audio Silence period.

NOTE: Alarms generated by externally connected, third-party monitors are not displayed on the Narkomed 4 central alarm display.

Alarm Annunciation

Each alarm category is associated with a specific audible signal:

Warnings A three-pulse tone pattern that is initially repeated every few seconds in a series of descending volume, and then constantly at full volume until the alarm condition is resolved

Cautions A three-pulse tone pattern that is repeated every 30 seconds

Advisories A single tone or no sound at all, depending on the urgency of the advisory

The Narkomed 4 annunciates only the highest-priority, currently active alarm. Lower-priority alarms are temporarily suppressed to minimize the confusion caused by simultaneous alarms.

If the primary speaker on the Narkomed 4 fails, a backup speaker is activated. The backup speaker has a tinny sound to distinguish it from the primary speaker. Another indication of the failure of the primary speaker is the appearance of the Advisory message SPEAKER FAIL on the alarm display.

Section 2
General Description

Ventilation Alarms

When the system power switch is turned from STANDBY to ON, the volume and pressure apnea alarms are automatically disabled to allow machine setup without nuisance alarms. An interlock with the ventilator ensures that when the ventilator is turned on, the alarms are enabled. You can also enable the alarms individually using the appropriate ALARM ON key on the main display or remote display.

When the ventilator is turned off, the following events occur:

- If the pressure apnea threshold was greater than 15 cmH_2O when the ventilator was turned off, the threshold setting is changed to 15 cmH_2O. (If the pressure apnea threshold was less than 15 cmH_2O when the ventilator was turned off, the threshold retains its setting.)

- The Cautions and Warnings associated with apnea alarms change from activation after 15 and 30 seconds of apnea to 30 and 60 seconds, respectively.

When the ventilator is turned back on, the pressure apnea threshold is restored to its previous set value and the apnea alarms revert to activation after 15 seconds (caution) and 30 seconds (warning) of apnea.

Printer (optional)

The Narkomed 4 can be equipped with an internal thermal printer that prints both numerical (cardiovascular, temperature, ventilation, etc.) and graphical (traces, trends, etc.) information.

O.R. Data Manager (optional)

The O.R. Data Manager is an electronic data management system consisting of a keyboard and a central processing unit with disk drive. It creates electronic anesthesia records from information automatically recorded by the monitoring system and input from the keyboard (such as patient data, events, drugs, and other case-related information), as well as externally interfaced monitors.

In addition to creating anesthesia records, the O.R. Data Manager can display case information on the Narkomed 4 in the form of a graph and can print anesthesia records to a disk or laser printer.

Manual Sphygmo-manometer (optional)

Noninvasive blood pressure can be measured with the manual sphygmomanometer. Several cuff sizes are available to accommodate varying patient requirements.

Section 3
Daily Checkout

Daily Checkout Procedure

Before operating the Narkomed 4, the following checkout procedure must be performed to make sure the machine is ready for use. This is a recommended procedure. Follow your institution's policies for specific checkout procedures. If the anesthesia system fails any procedures identified by an asterisk (*), do not use the machine. Contact a North American Dräger qualified technical service representative for inspection of the unit.

NOTE: Do not insert any additional components into, or modify, the anesthesia system after the checkout procedure is started.

Initial Setup and Verification

1. Enter the serial number located on the right rear leg into the anesthesia record.

2. Make sure there is a valid inspection sticker on the back of the machine indicating that the anesthesia machine was serviced and inspected by a North American Dräger qualified technical service representative.

3. Verify that a cylinder wrench is tethered to the back of the machine next to one of the cylinders.

4. If the anesthesia machine is not already plugged in, connect the electrical power cable to an active AC outlet that accepts and properly grounds the power cable. **Do not** use "cheater" plugs. The term "cheater" plug implies any and all electrical plugs or other devices that can inhibit or prohibit the proper grounding of the anesthesia machine.

System Software Diagnostics

*5. Turn the SYSTEM POWER switch to the ON position. Wait for the machine to complete its diagnostic checks. Make sure the system is functional.

Battery Power Verification

*6. Check the reserve battery power. Remove the power plug from the outlet. Press the BATTERY TEST button on the main switch panel. The green indicator to the left of the test button must light. The yellow BATTERY LOW indicator must remain unlit. Plug the power cable back into the electrical outlet.

NOTE: This test assumes that the anesthesia machine has been plugged in for 12 hours. The battery charging system works only when the machine is connected to an active AC power source. The charging system takes about 12 hours to charge a fully discharged battery.

Section 3
Daily Checkout

Emergency Ventilation Equipment Verification

*7. Verify that backup ventilation equipment is available and functional.

High Pressure System Verification

*8. Check the oxygen cylinder supplies.

A. Disconnect all pipeline gas supply hoses and drain the system.

B. Close the oxygen cylinder valve and remove the cylinder from the yoke. Verify that there is one cylinder gasket and there are two index pins. Verify that the cylinder matches the yoke label. Place the cylinder back in its yoke.

C. Open an oxygen cylinder and check the cylinder pressure gauge. A full oxygen cylinder registers about 1900 psi. Replace any cylinder with pressure less than 1000 psi. To check for a high pressure leak, close the cylinder and observe the cylinder pressure gauge for a prominent decrease in the pressure.

D. If the machine is equipped with dual oxygen yokes, repeat these procedures for the other cylinder yoke.

*9. Check the nitrous oxide cylinder supplies.

A. Close the nitrous oxide cylinder valve and remove the cylinder from the yoke. Verify that there is one cylinder gasket and there are two index pins. Verify that the cylinder matches the yoke label. Place the cylinder back in its yoke.

B. Open the nitrous oxide flow control valve until the nitrous oxide pipeline and cylinder pressure gauges indicate zero pressure. Open a nitrous oxide cylinder and check the cylinder pressure gauge. A full nitrous oxide cylinder registers about 745 psi. Replace any cylinder with a pressure less than 600 psi. To check for a high pressure leak, close the cylinder and observe the cylinder pressure gauge for a prominent decrease in the pressure.

C. If the machine is equipped with dual nitrous oxide cylinder yokes, repeat these procedures for the other cylinder yoke.

*10. Check additional (optional) gas cylinder supplies.

A. With the cylinder closed, open the flow control valve of the associated gas until the cylinder and pipeline pressure gauges (air only) indicate zero pressure.

B. Close the cylinder valve and remove the cylinder from the yoke. Verify that there is one cylinder gasket and there are two index pins. Verify that the cylinder matches the associated yoke label. Place the cylinder back in its yoke.

C. Open the associated flow control valve until the cylinder pressure gauges indicate zero pressure. Open the cylinder and check the cylinder pressure gauge. Replace the cylinder if its contents are insufficient for the intended procedure. To check for a high pressure leak, close the cylinder and observe the cylinder pressure gauge for a prominent decrease in the pressure.

NOTE: After testing all of the gas circuits, drain the oxygen circuit by closing the oxygen cylinder and actuating the oxygen flush button on the front of the anesthesia machine. Hold the button in until the pressure gauges indicate no pressure.

The following table shows the full and minimum pressures (E-size cylinders at 70°F, 21°C) for all gases available for the anesthesia machine.

GAS	PSI - FULL*	PSI - MIN
Air	1900	1000
Carbon Dioxide	838	600
Nitrous Oxide	745	600
Oxygen	1900	1000

*typical full load

Section 3
Daily Checkout

Pipeline Supply System Verification

*11. Pipeline Supply Verification

A. Inspect the supply hoses for cracks or wear.

B. Connect the appropriate hospital pipeline supply hoses from the wall outlet fittings to the pipeline inlet connectors.

C. Check for sufficient pipeline pressure readings for each gas on the pipeline pressure gauges located below the flow control valves. The pressure for each gas must be between 50–55 psi. Open the flow control valve for each gas to a moderate value. The pressure indicated at the pipeline pressure gauge must not decrease more than 5 psi.

D. Verify that the correct gases are supplied to the anesthesia machine inlets.

Low Pressure System Verification

*12. Vaporizer Verification

A. Check for sufficient supply of liquid anesthetic in the vaporizer(s). The liquid level indicated in the vaporizer sight glass must be between the minimum and maximum markings.

B. Make sure the fill and drain valves are completely closed.

C. Check the vaporizer exclusion device, which prevents more than one vaporizer from being activated simultaneously. Make sure that when one vaporizer handwheel is turned to a setting greater than 0, the others remain locked in their 0 positions. Test all of the vaporizer positions. Then, turn all vaporizers to the 0 position.

System Gas Circuit Verification

*13. Check the flowmeters. Adjust the flow control knob for each gas and verify the proper operation of the corresponding flowmeters. The float must move freely over the full range of each flowmeter.

Oxygen Monitor Calibration

*14. Calibrate the oxygen monitor by exposing the sensor to ambient air and activate the calibration key. (See “Oxygen Monitoring, Calibrating the Oxygen Sensor” in Section 5 for more information.)

A. Place the oxygen sensor securely in the sensor mount.

B. Verify that the correct gas concentrations are supplied to the anesthesia system from the supply cylinders.

C. Close the cylinder supplies and deplete the pressure from the system.

OFPD Verification

*15. Check the oxygen failure protection device. With all gases available on the machine set to a flow of about 4 l/min, close the oxygen supply by disconnecting the oxygen pipeline supply hose and closing the oxygen cylinder(s). The flow of all other gases indicated by their flowmeters must decrease in proportion to the decrease in oxygen flow and eventually shut off.

ORC Verification

*16. Check the function of the ORC. With the nitrous oxide flow control valve open to a flow of 10 l/min, vary the oxygen flow with the oxygen flow control valve. The nitrous oxide flow indicated on the nitrous oxide flowmeter must automatically vary in response to the adjustment of the oxygen flow control valve.

The ORC must maintain a fresh gas oxygen/nitrous oxide flow ratio of at least 25 ±4 % oxygen.

NOTE: When the nitrous oxide flow control valve is open and oxygen is flowing at a minimum rate (150–200 ml/min), nitrous oxide flows at approximately 500 ml/min.

Oxygen Flush Verification

*17. Check the oxygen flush:

A. Press the oxygen flush button and listen for an audible gas flow sound, accompanied by a marked increase in oxygen concentration in the breathing system.

B. Check the delivered oxygen concentration. Repeatedly flush the patient breathing system by pressing the oxygen flush button. Open the oxygen flow control valve to a flow of 8 l/min and close the other flow control valves. The oxygen measurement display area should indicate 97% to 100% oxygen concentration.

Fresh Gas Verification

*18. Make sure all vaporizers are closed. Open the oxygen flow control valve to an 8 l/min flow and close all other flow control valves. Sniff the gas coming from the fresh gas common outlet. There should be no noticeable odor.

Bain Circuit Adapter Verification

*19. Verify that the inner tube of the Bain circuit is intact and not occluded. First deliver a flow of oxygen to the Bain circuit through the fresh gas hose. Then occlude the inner tube of the Bain circuit. The oxygen flowmeter float should drop in response to the occlusion.

As an alternate test, press the oxygen flush button with the Bain circuit's patient port open to the atmosphere. The high flow of gas through the Bain circuit's inner tube will draw in gas from the outer tube. As a result, the breathing bag should deflate. If the breathing bag does not deflate or it inflates, the fresh gas hose or inner tube may be improperly connected.

Absorber System Verification

*20. To check the absorber system:

A. Check the hose connections in the breathing system.

B. Make sure the fresh gas hose of the breathing system is securely connected to the fresh gas outlet.

C. Make sure a 22 mm patient breathing circuit is connected between the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor.

D. Make sure a 22 mm breathing hose is connected between the ventilator hose terminal and the manual/automatic selector valve breathing hose terminal.

E. Make sure a breathing bag of proper capacity and appropriate construction is connected to the breathing bag terminal of the breathing system.

F. Make sure the respiratory gas analysis sample line is connected to the 15 mm patient side of the Y-piece.

G. Make sure the breathing pressure pilot line is properly connected between the BREATHING PRESSURE interface and either the absorber quick-connect fitting or the appropriate fitting at or near the patient Y-piece.

H. Make sure the oxygen sensor and respiratory volume sensor are properly installed.

*21. Make sure the absorber canisters are filled with CO_2 absorbent. Consult the absorbent manufacturer's literature for information on what signs to expect when the absorbent is exhausted. Replace the absorbent when it appears exhausted. Make sure that the color change represents the absorbent's true state of depletion and is not due to regeneration after a rest period. Flushing the anesthesia machine continuously with 100% oxygen for at least one minute before the first case of the day is recommended.

Remove accumulated absorbent dust and water from the absorber dust cup.

WARNING: Absorbent is caustic and is a strong eye, skin, and respiratory tract irritant. When emptying the absorber dust cup, take care not to spill its caustic contents.

NOTE: When changing the CO_2 absorbent, take care not to chip or crack the absorbent canister. Check the canister for signs of damage, especially along the rim, before reinstallation.

22. Close all vaporizers and flow control valves. Check for free gas passage in the patient breathing system. Wear a surgical mask to inhale and exhale through the breathing system (each limb individually, if possible). Verify the unidirectional flow in each limb and then reconnect the tubing.

APL Valve

*23. Check the APL valve to be sure it can relieve excess gas from the breathing system into the scavenger system.

To check the APL valve's flow resistance:

A. Set the manual/automatic selector valve to BAG.

B. Remove the bag from the swivel arm bag mount.

C. Interconnect the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor with a 22 mm hose.

D. Completely open the APL valve by turning the control knob fully counterclockwise to its stop position.

E. Turn the SYSTEM POWER switch to ON.

F. Open the oxygen flow control valve to a flow of 8 l/min.

G. Occlude the bag mount opening and watch for a pressure increase on the breathing system pressure gauge. This pressure increase must not exceed 3 cmH_2O.

Breathing System Leak Test

24. Perform a breathing and fresh gas delivery system pressure test. This test detects leaks from the patient breathing system and fresh gas delivery system.

To perform the test:

A. Close all flow control valves on the anesthesia machine.

B. Turn the SYSTEM POWER switch to the STANDBY position.

C. Turn the vaporizers to 0% concentration.

D. Interconnect the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor with a 22 mm breathing hose.

E. Set the manual/automatic selector valve to BAG.

F. Close the APL valve by turning the knob fully clockwise to its stop position.

G. Check that the breathing pressure gauge is on 0.

H. Attach the supplied test terminal to the breathing bag mount.

I. Connect a sphygmomanometer squeeze bulb (available from North American Dräger) to the hose barb on the test terminal.

J. Pump the squeeze bulb by hand until the breathing system pressure gauge indicates pressure of at least 50 cmH_2O (not to exceed 80 cmH_2O).

K. Observe the pressure drop at the breathing system pressure gauge. When the pressure is at 50 cmH_2O, begin counting seconds. The pressure must not drop more than 20 cmH_2O in 30 seconds.

Scavenger System

*25. Verify the performance of the scavenger system.

To test the open reservoir scavenger system:

A. Make sure a 19 mm scavenger hose is connected between the ventilator relief valve and the scavenger interface.

B. Make sure a 19 mm scavenger hose is connected between the APL valve on the absorber and the 19 mm hose terminal on the back of the absorber pole.

C. Make sure a 19 mm scavenger hose is connected between the bottom of the absorber pole and the scavenger interface.

D. Check for moisture accumulation in the breathing and scavenger hoses. Remove any moisture found.

E. Verify the safe performance of the open reservoir scavenging system. With the scavenging system properly installed and operating, test for positive and negative pressure relief.

To test for negative pressure relief:

F. Connect a vacuum hose to the DISS threaded terminal on the left-hand side of the scavenger (or attach a wall suction hose onto the adapter's hose-barb fitting).

G. Short-circuit the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor with a 22 mm breathing hose.

H. Set the absorber's manual/automatic selector valve to BAG.

I. Turn the APL valve control knob fully counterclockwise.

J. Verify that the suction waste gas disposal system is active.

K. Adjust the scavenger needle valve to a flowmeter indication between the two white lines.

L. Close all flow control valves on the anesthesia system.

M. Occlude the absorber breathing bag terminal and observe the breathing pressure gauge on the absorber. The gauge should indicate only a negligible negative pressure (no lower than -0.5 cmH_2O).

To test for positive pressure relief:

N. Perform steps A through E.

O. If the system is equipped with a PEEP valve, turn the PEEP valve control knob fully counterclockwise to its lowest setting.

P. Adjust the scavenger needle valve to a completely closed position by turning it fully clockwise.

Q. Open the oxygen flow control valve to a flow of 10 l/min and occlude the absorber breathing bag terminal.

R. The flow of oxygen must now exit through the relief ports located on top of the canister. The absorber system's breathing pressure gauge must indicate a pressure less than 5 cm H_2O.

S. After the test, adjust the scavenger needle valve to a flowmeter indication halfway between the two white lines.

To test the scavenger interface for passive systems:

A. Make sure a 19 mm scavenger hose is connected between the ventilator relief valve and the scavenger interface.

B. Make sure a 19 mm scavenger hose is connected between the APL valve on the absorber and the 19 mm hose terminal on the back of the absorber pole.

C. Make sure a 19 mm scavenger hose is connected between the bottom of the absorber pole and the scavenger interface.

D. Check for moisture accumulation in the breathing and scavenger hoses. Remove any moisture found.

E. Short-circuit the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor with a 22 mm breathing hose.

F. Set the absorber's manual/automatic selector valve to AUTO.

G. If the system is equipped with a PEEP valve, turn the PEEP valve control knob fully counterclockwise to its lowest setting.

H. Open the oxygen flow control valve to a flow of 10 l/min and occlude the 19 mm scavenger terminal labeled EXHAUST.

I. After the ventilator bellows inflates, the flow of oxygen exits the system through the positive pressure safety relief valve. At this point, the absorber system's breathing pressure gauge must indicate a pressure of less than 10 cmH_2O.

Manual and Automatic Ventilation Systems

*26. Test the ventilator.

A. Check for proper pressure and flow at the Y-piece during the inspiratory and expiratory phases. Turn the SYSTEM POWER switch and ventilator power switch to their ON positions. Place the manual/automatic selector valve in the AUTO position. Adjust the oxygen flow control valve to a 3 l/min flow. Set the ventilator frequency to 3 BPM, the I:E ratio to 1:2, and the tidal volume to about 1 liter. (If testing the Pediatric Bellows or Adult/Pediatric Bellows, adjust the tidal volume to 200 ml.)

Adjust the ventilator inspiratory flow control to the maximum of the “low” zone on the flow gauge. Occlude the patient side of the Y-piece. Fill the ventilator bellows by pressing the oxygen flush button. Observe the breathing system pressure gauge as the ventilator cycles.

The pressure gauge must indicate a pressure over 30 cmH_2O when the bellows completes its downward travel. The pressure should not exceed 3 cmH_2O at the end of the expiratory phase when the bellows completes its upward travel.

B. If the system is equipped with a PEEP valve, verify the PEEP valve’s performance. Attach a breathing bag to the patient Y-piece with an appropriate adapter such as an NAD combination mask elbow with a 22 mm male fitting for the breathing bag and 15 mm male fitting for the Y-piece. With the manual/automatic selector valve in the AUTO position, set the ventilator to the preferred frequency.

Set the PEEP bypass switch to the PEEP ON position. Then adjust the PEEP valve to different values and observe the breathing system pressure gauge to verify performance. Turn the PEEP valve control knob fully counterclockwise to its lowest setting after the test is completed. Set the PEEP bypass switch to the PEEP OFF position.

27. Inspect the respiratory gas analysis sample line for kinks or occlusions. Check the water trap’s reservoir level; replace if filled to maximum capacity.

Monitors

28. Check the alarm limit settings. The monitor alarm limits are automatically set to a default configuration when the SYSTEM POWER switch is turned on. Check these settings and adjust them if necessary. Alarm limits can be adjusted at the beginning of—or during—a procedure. Also, make sure that any external monitors (if any) are connected properly.

*29. Test the alarm functions for all monitors. Simulate alarm conditions and check for appropriate alarm signals.

System Flush

30. Flush the system with 100% oxygen by pressing the oxygen flush button.

Fresh Gas Oxygen Sensor Adapter Option Verification

31. If the optional fresh gas oxygen sensor adapter is installed, make sure the fresh gas hose connection is intact and not occluded. Verify that the oxygen analyzer is properly calibrated (for more information, see “Calibrating the Oxygen Sensor” in Section 5, “Operation, Oxygen Monitoring”). When removing the oxygen sensor during calibration, insert the oxygen sensor port plug into the fresh gas adapter port.

Final Position

32. When the daily checkout procedure is complete, verify that:

A. all vaporizers are off (the handwheels are set to zero)

B. the APL Valve is open (fully counterclockwise)

C. the manual/automatic switch is set to BAG

D. all flowmeters indicate 0 (or minimum)

E. the patient suction is level adequate

F. the breathing system is ready to use (the bag is in place and all hoses are connected properly)

Section 4
Preuse Checkout

Preuse Checkout Procedure

Perform the following abbreviated checkout procedure when the Narkomed 4 is used in successive cases. It may be performed only after the initial daily checkout procedure given in Section 3 was performed. This is a recommended procedure. Follow your institution's policies regarding specific checkout procedures. If the anesthesia system fails any procedures identified by an asterisk (*), do not use the machine. Contact a North American Dräger qualified technical service representative for inspection of the unit.

NOTE: Do not insert any additional components into or modify the anesthesia system after the checkout procedure is started.

Reserve Power Verification

*1. Check the reserve battery power. Make sure that the SYSTEM POWER switch is turned to the ON position. Remove the power plug from the outlet. Press the BATTERY TEST button on the main switch panel. The green indicator to the left of the test button must light. The yellow BATTERY LOW indicator must remain unlit. Plug the power cable back into the electrical outlet.

NOTE: This test assumes that the anesthesia machine has been plugged in for 12 hours. The battery charging system works only when the machine is connected to an active AC power source. The charging system takes about 12 hours to charge a fully discharged battery.

Bain Circuit Adapter Verification

*2. Verify that the inner tube of the Bain circuit is intact and not occluded. First deliver a flow of oxygen to the Bain circuit through the fresh gas hose. Then occlude the inner tube of the Bain circuit. The oxygen flowmeter float should drop in response to the occlusion.

As an alternate test, press the oxygen flush button with the Bain circuit's patient port open to the atmosphere. The high flow of gas through the Bain circuit's inner tube will draw in gas from the outer tube. As a result, the breathing bag should deflate. If the breathing bag does not deflate or it inflates, the fresh gas hose or inner tube may be improperly connected.

Absorber System Verification

*3. To check the absorber system:

A. Check the hose connections in the breathing system.

B. Make sure the fresh gas hose of the breathing system is securely connected to the fresh gas outlet.

C. Make sure a 22 mm patient breathing circuit is connected between the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor.

D. Make sure a 22 mm breathing hose is connected between the ventilator hose terminal and the manual/automatic selector valve breathing hose terminal.

E. Make sure a breathing bag of proper capacity and appropriate construction is connected to the breathing bag terminal of the breathing system.

F. Make sure the respiratory gas analysis sample line is connected to the 15 mm patient side of the Y-piece.

G. Make sure the breathing pressure pilot line is properly connected between the BREATHING PRESSURE interface and either the absorber quick-connect fitting or the appropriate fitting at or near the patient Y-piece.

H. Make sure the oxygen sensor and respiratory volume sensor are properly installed.

*4. Make sure the absorber canisters are filled with CO_2 absorbent. Consult the absorbent manufacturer's literature for information on what signs to expect when the absorbent is exhausted. Replace the absorbent when it appears exhausted. Make sure that the color change represents the absorbent's true state of depletion and is not due to regeneration after a rest period. Flushing the anesthesia machine continuously with 100% oxygen for at least one minute before the first case of the day is recommended.

Remove accumulated absorbent dust and water from the absorber dust cup.

WARNING: Absorbent is caustic and is a strong eye, skin, and respiratory tract irritant. When emptying the absorber dust cup, take care not to spill its caustic contents.

NOTE: When changing the CO_2 absorbent, take care not to chip or crack the absorbent canister. Check the canister for signs of damage, especially along the rim, before reinstallation.

5. Close all vaporizers and flow control valves. Check for free gas passage in the patient breathing system. Wear a surgical mask to inhale and exhale through the breathing system (each limb individually, if possible). Verify the unidirectional flow in each limb and then reconnect the tubing.

APL Valve

*6. Check the APL valve to be sure it can relieve excess gas from the breathing system into the scavenger system.

To check the APL valve's flow resistance:

A. Set the manual/automatic selector valve to BAG.

B. Remove the bag from the swivel arm bag mount.

C. Interconnect the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor with a 22 mm hose.

D. Completely open the APL valve by turning the control knob fully counterclockwise to its stop position.

E. Turn the SYSTEM POWER switch to ON.

F. Open the oxygen flow control valve to a flow of 8 l/min.

G. Occlude the bag mount opening and watch for a pressure increase on the breathing system pressure gauge. This pressure increase must not exceed 3 cmH_2O.

Breathing System Leak Test

7. Perform a breathing and fresh gas delivery system pressure test. This test detects leaks from the patient breathing system and fresh gas delivery system.

To perform the test:

A. Close all flow control valves on the anesthesia machine.

B. Turn the SYSTEM POWER switch to the STANDBY position.

C. Turn the vaporizers to 0% concentration.

D. Interconnect the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor with a 22 mm breathing hose.

E. Set the manual/automatic selector valve to BAG.

F. Close the APL valve by turning the knob fully clockwise to its stop position.

G. Check that the breathing pressure gauge is on 0.

H. Attach the supplied test terminal to the breathing bag mount.

I. Connect a sphygmomanometer squeeze bulb (available from North American Dräger) to the hose barb on the test terminal.

J. Pump the squeeze bulb by hand until the breathing system pressure gauge indicates pressure of at least 50 cmH_2O (not to exceed 80 cmH_2O).

K. Observe the pressure drop at the breathing system pressure gauge. When the pressure is at 50 cmH_2O, begin counting seconds. The pressure must not drop more than 20 cmH_2O in 30 seconds.

Scavenger System

*8. Verify the performance of the scavenger system.

To test the open reservoir scavenger system:

A. Make sure a 19 mm scavenger hose is connected between the ventilator relief valve and the scavenger interface.

B. Make sure a 19 mm scavenger hose is connected between the APL valve on the absorber and the 19 mm hose terminal on the back of the absorber pole.

C. Make sure a 19 mm scavenger hose is connected between the bottom of the absorber pole and the scavenger interface.

D. Check for moisture accumulation in the breathing and scavenger hoses. Remove any moisture found.

E. Verify the safe performance of the open reservoir scavenging system. With the scavenging system properly installed and operating, test for positive and negative pressure relief.

To test for negative pressure relief:

F. Connect a vacuum hose to the DISS threaded terminal on the left-hand side of the scavenger (or attach a wall suction hose onto the adapter's hose-barb fitting).

G. Short-circuit the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor with a 22 mm breathing hose.

H. Set the absorber's manual/automatic selector valve to BAG.

I. Turn the APL valve control knob fully counterclockwise.

J. Verify that the suction waste gas disposal system is active.

K. Adjust the scavenger needle valve to a flowmeter indication between the two white lines.

L. Close all flow control valves on the anesthesia system.

M. Occlude the absorber breathing bag terminal and observe the breathing pressure gauge on the absorber. The gauge should indicate only a negligible negative pressure (no lower than -0.5 cmH_2O).

To test for positive pressure relief:

N. Perform steps A through E.

O. If the system is equipped with a PEEP valve, turn the PEEP valve control knob fully counterclockwise to its lowest setting.

P. Adjust the scavenger needle valve to a completely closed position by turning it fully clockwise.

Q. Open the oxygen flow control valve to a flow of 10 l/min and occlude the absorber breathing bag terminal.

R. The flow of oxygen must now exit through the relief ports located on top of the canister. The absorber system's breathing pressure gauge must indicate a pressure less than 5 cm H_2O.

S. After the test, adjust the scavenger needle valve to a flowmeter indication halfway between the two white lines.

To test the scavenger interface for passive systems:

A. Make sure a 19 mm scavenger hose is connected between the ventilator relief valve and the scavenger interface.

B. Make sure a 19 mm scavenger hose is connected between the APL valve on the absorber and the 19 mm hose terminal on the back of the absorber pole.

C. Make sure a 19 mm scavenger hose is connected between the bottom of the absorber pole and the scavenger interface.

D. Check for moisture accumulation in the breathing and scavenger hoses. Remove any moisture found.

E. Short circuit the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor with a 22 mm breathing hose.

F. Set the absorber's manual/automatic selector valve to AUTO.

G. If the system is equipped with a PEEP valve, turn the PEEP valve control knob fully counterclockwise to its lowest setting.

H. Open the oxygen flow control valve to a flow of 10 l/min and occlude the 19 mm scavenger terminal labeled EXHAUST.

I. After the ventilator bellows inflates, the flow of oxygen exits the system through the positive pressure safety relief valve. At this point, the absorber system's breathing pressure gauge must indicate a pressure of less than 10 cmH_2O.

Manual and Automatic Ventilation Systems

*9. Test the ventilator.

A. Check for proper pressure and flow at the Y-piece during the inspiratory and expiratory phases. Turn the SYSTEM POWER switch and ventilator power switch to their ON positions. Place the manual/automatic selector valve in the AUTO position. Adjust the oxygen flow control valve to a 3 l/min flow. Set the ventilator frequency to 3 BPM, the I:E ratio to 1:2, and the tidal volume to about 1 liter. (If testing the Pediatric Bellows or Adult/Pediatric Bellows, adjust the tidal volume to 200 ml.)

Adjust the ventilator inspiratory flow control to the maximum of the “low” zone on the flow gauge. Occlude the patient side of the Y-piece. Fill the ventilator bellows by pressing the oxygen flush button. Observe the breathing system pressure gauge as the ventilator cycles.

The pressure gauge must indicate a pressure over 30 cmH_2O when the bellows completes its downward travel. The pressure should not exceed 3 cmH_2O at the end of the expiratory phase when the bellows completes its upward travel.

B. If the system is equipped with a PEEP valve, verify the PEEP valve’s performance. Attach a breathing bag to the patient Y-piece with an appropriate adapter such as an NAD combination mask elbow with a 22 mm male fitting for the breathing bag and 15 mm male fitting for the Y-piece. With the manual/automatic selector valve in the AUTO position, set the ventilator to the preferred frequency.

Set the PEEP bypass switch to the PEEP ON position. Then adjust the PEEP valve to different values and observe the breathing system pressure gauge to verify performance. Turn the PEEP valve control knob fully counterclockwise to its lowest setting after the test is completed. Set the PEEP bypass switch to the PEEP OFF position.

10. Inspect the respiratory gas analysis sample line for kinks or occlusions. Check the water trap’s reservoir level; replace if filled to maximum capacity.

Section 4
Preuse Checkout

Monitors

11. Check the alarm limit settings. The monitor alarm limits are automatically set to a default configuration when the SYSTEM POWER switch is turned on. Check these settings and adjust them if necessary. Alarm limits can be adjusted at the beginning of—or during—a procedure. Also, make sure that any external monitors (if any) are connected properly.

*12. Test the alarm functions for all monitors. Simulate alarm conditions and check for appropriate alarm signals.

System Flush

13. Flush the system with 100% oxygen by pressing the oxygen flush button.

Fresh Gas Oxygen Sensor Adapter Option Verification

14. If the optional fresh gas oxygen sensor adapter is installed, make sure the fresh gas hose connection is intact and not occluded. Verify that the oxygen analyzer is properly calibrated (for more information, see “Calibrating the Oxygen Sensor” in Section 5, “Operation, Oxygen Monitoring”). When removing the oxygen sensor during calibration, insert the oxygen sensor port plug into the fresh gas adapter port.

Final Position

15. When the daily checkout procedure is complete, verify that:

A. all vaporizers are off (the handwheels are set to zero)

B. the APL Valve is open (fully counterclockwise)

C. the manual/automatic switch is set to BAG

D. all flowmeters indicate 0 (or minimum)

E. the patient suction is level adequate

F. the breathing system is ready to use (the bag is in place and all hoses are connected properly)

Section 5 - Operation
Gas Delivery System

Overview

The Narkomed 4 is a continuous flow anesthesia system with pneumatic circuitry for mixing and delivering gases and anesthetic agent vapor. The pneumatic system can deliver up to four gases and one anesthetic agent simultaneously. Oxygen and nitrous oxide are standard on all machines; available optional gases include air and carbon dioxide. Up to three vaporizers can be mounted on the machine; available vaporizers are for halothane, enflurane, isoflurane, sevoflurane, and desflurane.

Connecting the Pipeline Gas Supply

Gas from the hospital pipelines enters the Narkomed 4 through hoses connected to indexed inlets located on the side of the flowmeter housing. Depending on the country's standards and regulations, the available inlets are Diameter-Indexed Safety System (DISS) inlets (body or nut fitting), or National Institute for Standards and Technology (NIST) inlets.

To connect a pipeline supply to the Narkomed 4:

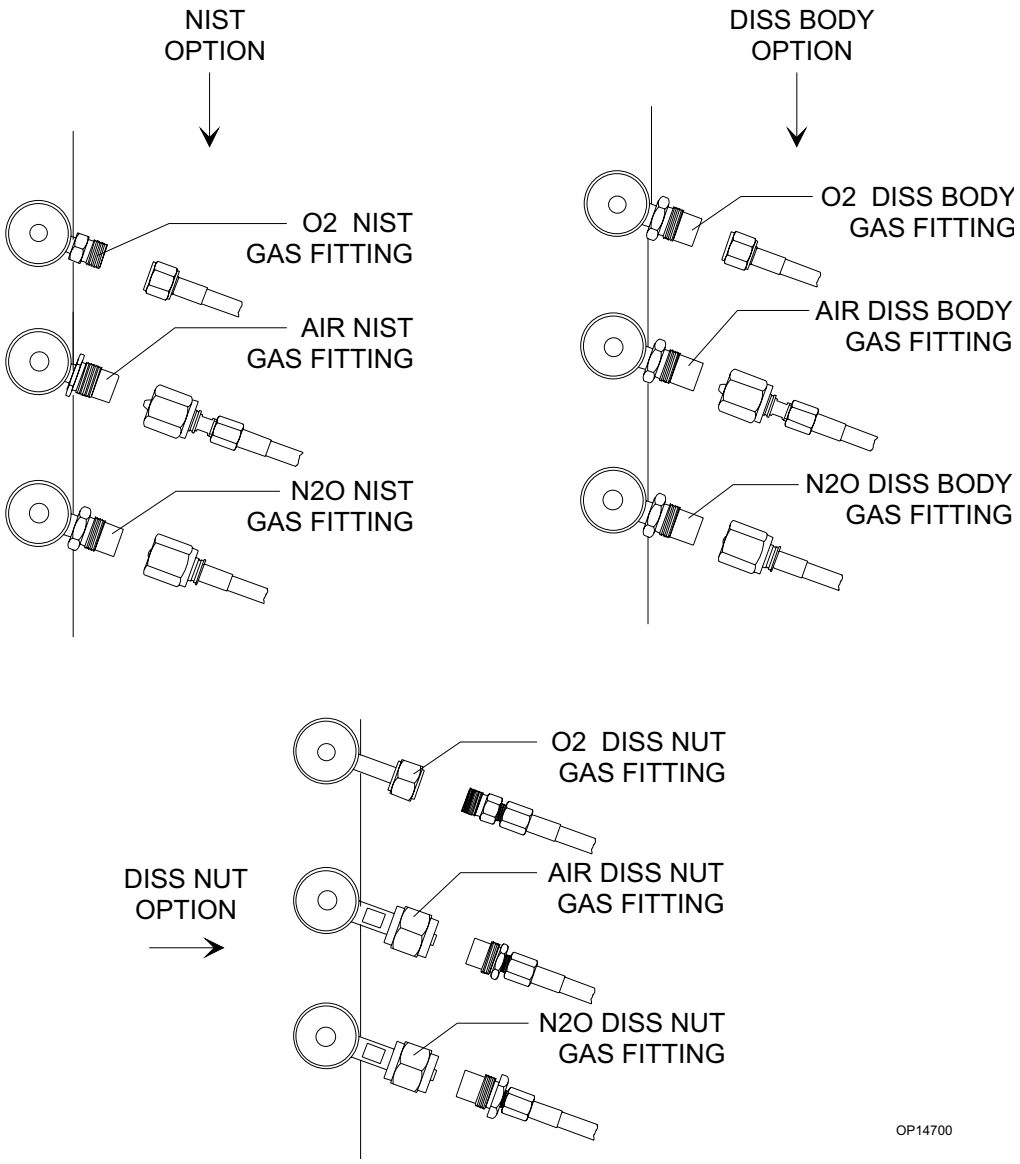
1. Connect the gas fitting on the supply hose to the corresponding gas fitting on the side of the flowmeter housing. Use a wrench to tighten the hex nut.

   WARNING: Carefully check hoses each time you connect a machine to a wall or ceiling outlet to ensure that both ends of the hose are indexed for the same gas. Pipeline delivery hoses used between wall outlets and anesthesia machines have caused accidents when, during assembly, an oxygen fitting was placed on one end of the hose and a nitrous oxide fitting on the other end.

2. Connect the other end of the supply hose to the appropriate functioning hospital pipeline supplies.

3. Check the pipeline pressure gauge on the front of the Narkomed 4 for sufficient pipeline pressure (50-55 psi).

Section 5 - Operation
Gas Delivery System



Connecting the Gas Cylinders

When attaching a cylinder, make sure that only one washer is installed between the cylinder and the yoke gas inlet. Using multiple washers may compromise the pin-indexed safety system. Be sure to verify the integrity of both index pins whenever you install a new cylinder.

To connect a gas cylinder to its yoke:

1. Place a new washer on the seat of the yoke gas inlet connection.

WARNING: Use only one cylinder washer per yoke. Using more than one washer could cause leakage of the cylinder gas and compromise the pin indexing system.

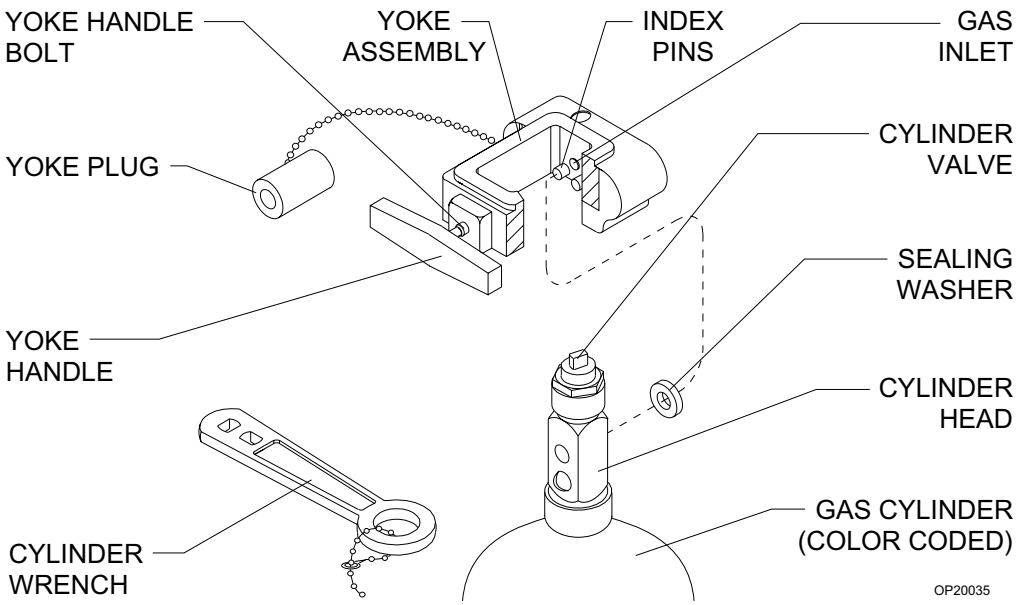
2. Verify the presence and integrity of the two index pins below the gas inlet.

   WARNING: Check cylinder yokes for the presence of two index pins each time you attach a cylinder to the machine.

3. Insert the head of a gas cylinder with matching gas into the yoke from below, so that the gas outlet and indexing holes on the cylinder head are facing the gas inlet and indexing pins on the yoke assembly.

4. Engage the indexing holes with the index pins. Screw the yoke handle clockwise against the cylinder head, so that the point of the yoke handle bolt is aligned with the countersunk recess on the back of the cylinder head.

5. Verify that the sealing washer is in place, that the index pins are engaged, and that the cylinder hangs vertically. Tighten the handle securely.



Section 5 - Operation
Gas Delivery System

Connecting the Fresh Gas Hose

To connect the fresh gas hose, pull out the fresh gas locking bar located on the front of the Narkomed 4 to its extended position. Insert the 15 mm male fitting on the fresh gas hose into the 15 mm female terminal. Release the spring-loaded locking bar over the fitting, allowing it to "lock" the fitting into place.

WARNING: Do not pinch or kink the fresh gas hose leading from the fresh gas outlet to the absorber.

Adjusting the Gas Flow

To adjust the gas flow:

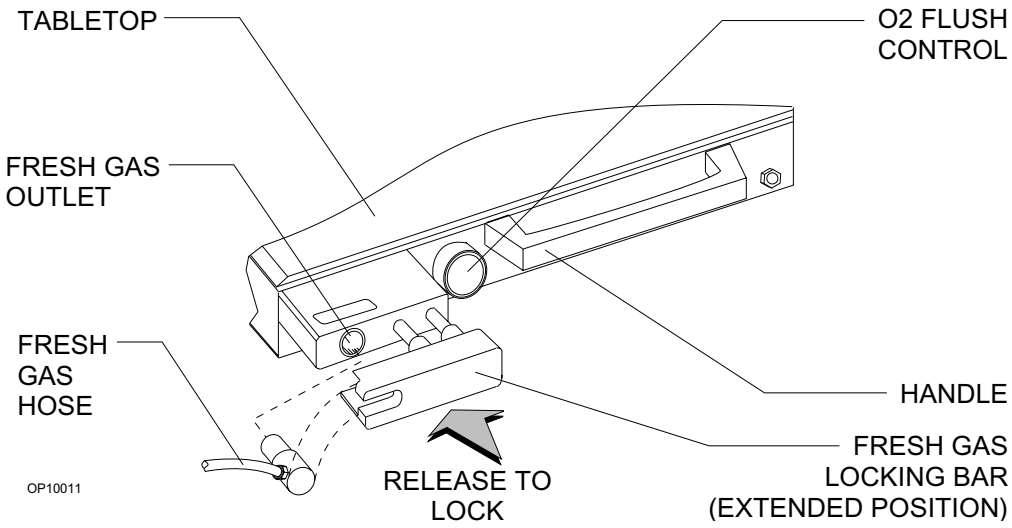
1. Turn the flow control knob located below the fine flowmeter tube for the gas you want to adjust. Turning the valve knob counterclockwise increases flow; turning the knob clockwise decreases flow.

2. As you adjust the flow control knob, observe the flow rate. Flow rate is indicated by the flowmeter scale reading at the center of the float.

   CAUTION: The flow of oxygen cannot be completely shut off (see "Minimum Oxygen Flow" in Section 2, "General Description"). Do not force the oxygen flow control knob past the zero stop in an effort to shut off the minimum flow; forcing the knob can damage the valve seat.

Using the Oxygen Flush

To use the oxygen flush, press the oxygen flush button, located on the front of the Narkomed 4, for a few seconds. This introduces an unmetered flow of pure oxygen into the breathing circuit at a rate of about 55 l/min.



Overview

The Vapor 19.1 adds an anesthetic gas to the fresh gas stream by producing a precisely metered amount of the vapor of a particular liquid anesthetic. The vaporizer is installed in the fresh gas line upstream of the patient breathing system (semi-closed, semi-open system).

WARNING: The vaporizer must not be connected downstream of the fresh gas outlet of the anesthesia machine.

For low flow (fresh gas flows lower than 250 ml/min) or closed system anesthesia, breathing circuit concentrations may differ considerably from the vaporizer setting. When performing anesthesia with low flow or closed system techniques, it is essential to monitor inspiratory and expiratory anesthesia concentration, oxygen concentration, expiratory volume, and airway pressure in the circuit.

The carrier gases used must be dry and free of oil and dust. The limits for moisture are as follows:

- dew point of oxygen ≤ 5° C
- dew point of air ≤ 5° C
- water contents of nitrous oxide ≤ 2 mg/l

NOTE: For information on the Tec 6 desflurane vaporizer, refer to its instruction manual.

Filling Systems

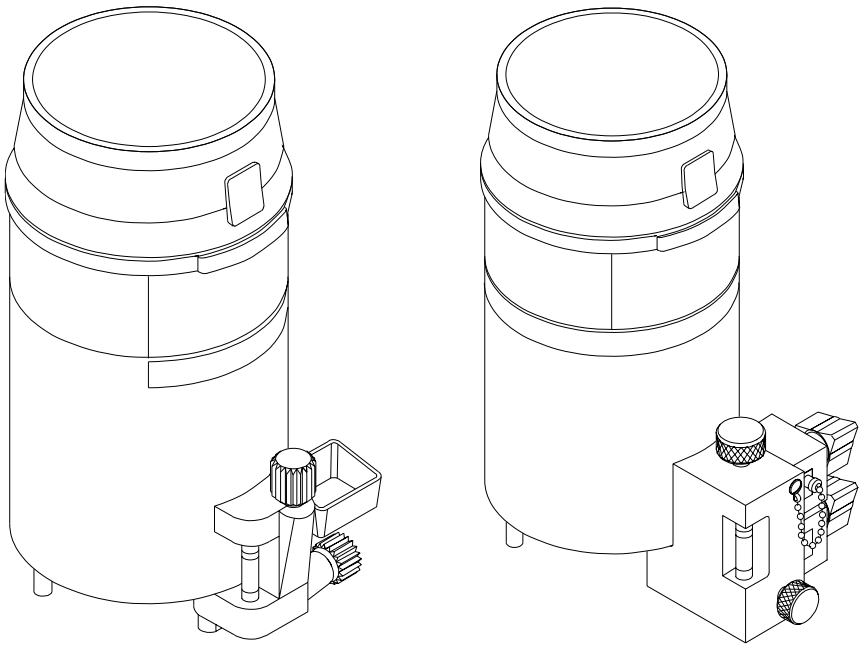
Two filling systems are available for the Vapor 19.1:

- Open funnel system
- Key indexed safety system

The following figure shows vaporizers with the two different types of available filling systems.

Section 5 - Operation
Vaporizer

OP10603



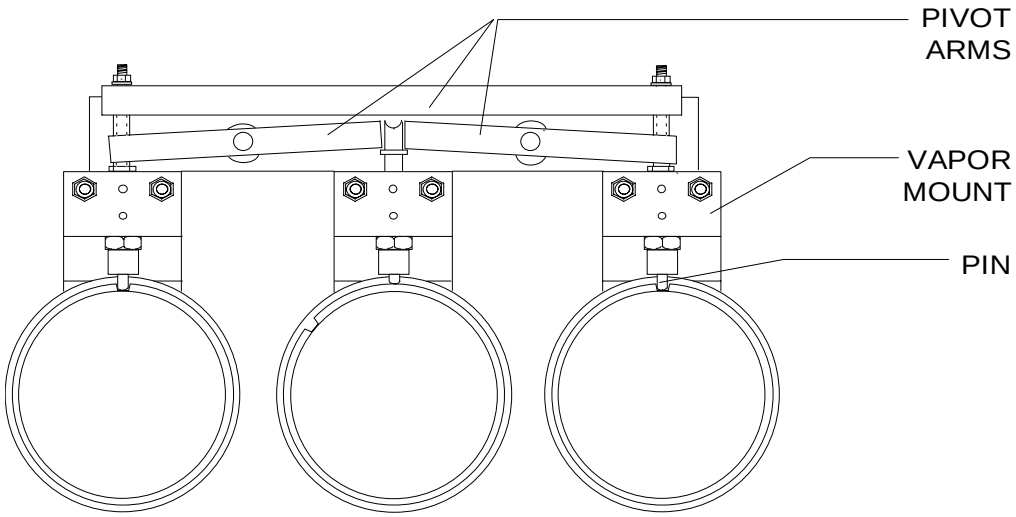
OPEN FUNNEL FILLER

KEY INDEXED
SAFETY SYSTEM

North American Dräger Exclusion System

A cam and lever exclusion (interlock) system incorporated into the vaporizer bank prevents more than one vaporizer from being activated at a time. The exclusion system requires all unused vaporizers to be locked in their zero percent positions.

WARNING: Only one vaporizer can be activated at a time. If the exclusion system permits simultaneous activation of two or more vaporizers and the anesthesia machine is turned on, the Caution message MULTI VAP SEL appears on the display screen. Do not use the anesthesia machine under these circumstances; contact a North American Dräger qualified technical service representative for adjustment.



Operating the Vaporizers

Before each case, check the following items.

1. Make sure the vaporizer contains a sufficient amount of anesthetic agent as indicated in the sight glass.

2. Make sure the filling and draining valves are closed. For vaporizers with the key indexed safety system, make sure the sealing plug is properly fitted and locking screw is tight.

3. Make sure the handwheel is set to “0” (zero-point interlock) and that the button is engaged.

NOTE: The Narkomed 4 is configured internally with information about what types of vaporizers are located in the vaporizer positions (left, center, and right). If a vaporizer is installed and the Narkomed's internal configuration is not set, the Advisory message VAP NOT CONFIG appears on the remote display. If this happens, contact a North American Dräger qualified technical service representative to configure the system.

Turning the Vaporizer On

To turn the vaporizer on:

1. Adjust the fresh gas flow.

2. Turn the vaporizer handwheel to the desired anesthetic concentration. Do not set the handwheel between 0 and 0.2% volume concentration (0.3% volume with Enflurane Vapor). This part of the handwheel actuates the on/off switch and cannot be calibrated.

   NOTE: After you turn on the vaporizer, activate the scavenger system to collect and remove vented gas from the operating room.

Turning the Vaporizer Off

To turn the vaporizer off, turn the vaporizer handwheel to “0” (zero-point interlock) and make sure the button engages. Do not interrupt the fresh gas flow until you have turned off the vaporizer.

NOTE: If you do not plan to use the vaporizer for more than a month, or if you remove it from the anesthesia machine, drain the anesthetic agent from the vaporizer.

Filling the Vaporizer

Before filling a vaporizer, identify the filling system on the device as one of the following:

- Open funnel system
- Key indexed safety system

When you have identified the filling system, locate the appropriate procedure and read it entirely before filling the device.

WARNING: Do not inhale anesthetic vapors while filling the vaporizer. Uncontrolled inhalation of anesthetic vapors is injurious to health.

Before filling a vaporizer, note the expiration date of the anesthetic agent. Do not use anesthetics beyond the date of expiration.

CAUTION: Each vaporizer is specifically designed and calibrated for one particular anesthetic agent. Do not fill a vaporizer with any anesthetic other than the particular agent indicated on the vaporizer.

- The isoflurane vaporizer must be filled with isoflurane only (trade names: Forane, Forene, Aerrane).

- The enflurane vaporizer must be filled with enflurane only (trade names: Ethrane, Alyrane).
- The halothane vaporizer must be filled with halothane only (trade name: Fluothane).
- The desflurane vaporizer must be filled with desflurane only (trade name: Suprane).
- The sevoflurane vaporizer must be filled with sevoflurane only (trade name: Ultane).

Do not use a vaporizer that has been inadvertently filled with the wrong anesthetic. Drain the vaporizer and return the device to North American Dräger's Technical Service Department.

Filling the Vaporizer During a Case

If you must fill the vaporizer during a case, be extremely careful. While fresh gas is flowing and the vaporizer is turned on, the vaporizing chamber is pressurized. DO NOT open the inlet valve (or the screw of the safety filling device) under these circumstances—liquid anesthetic may gush out. To safely add anesthetic agent while the machine is in use, depressurize the vaporizer by setting the handwheel to "0" (zero-point interlock); make sure the button engages in the locked position. Allow at least 5 seconds for the vaporizing chamber to depressurize, then use the appropriate procedure to add the anesthetic agent.

WARNING: The vaporizer handwheel must be set to "0" (zero-point interlock) before the vaporizer can be filled.

Filling Vaporizer With Open Funnel System

1. With the vaporizer in an upright position, turn the handwheel to "0" (zero-point interlock) and make sure the button engages in the locked position.
2. Make sure the filling spout is clean. To remove dust or other particles, use a clean, dry paper towel. Do not use water or other liquid cleaning solutions.
3. Make sure the drain valve is closed.
4. Open the inlet valve by turning it counterclockwise about three turns.

CAUTION: Be sure to fill the vaporizer in an upright position; filling the vaporizer in a tilted position may cause overfilling. Overfilling may cause the anesthetic concentration rate to be higher or lower than the handwheel setting.

5. Remove the cap from the anesthetic agent bottle. Check the sealing edge of the bottle for chipping or other damage. DO NOT use if damaged.

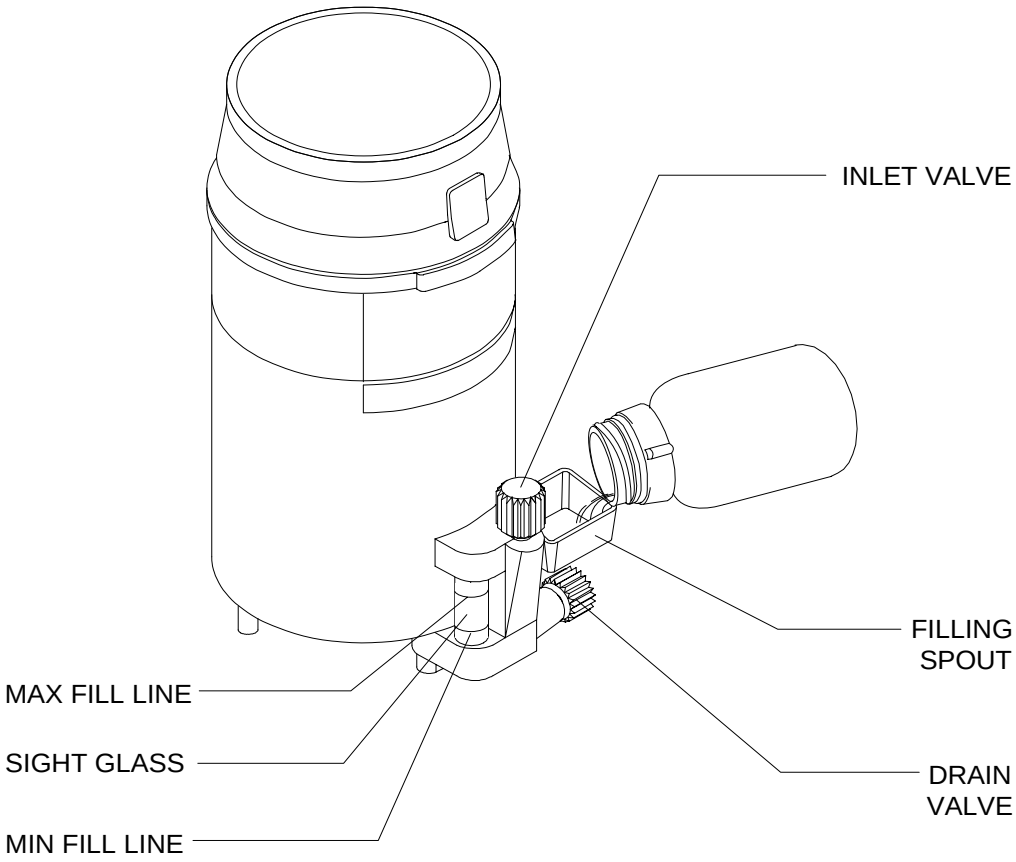
6. With the vaporizer in an upright position, pour the anesthetic agent into the funnel. As you pour the agent, observe the level through the sight glass. Fill the vaporizer to the MAX mark and close the inlet valve.

   NOTE: The capacity of the vaporizer is approximately 140 cm^3 with wet wick, and approximately 200 cm^3 with dry wick.

7. After filling, check the level at the sight glass. When the vaporizer is in an upright position, the level must not exceed the MAX mark.

   If the vaporizer is inadvertently overfilled (MAX mark exceeded), drain the excess anesthetic. For information on draining the vaporizer, refer to “Draining Vaporizer with Open Funnel Spout” later in this section.

8. Place the cap back on the bottle.



Filling Vaporizer With Key Indexed Safety System

The key indexed safety system employs a matching assembly to prevent inadvertent use of the wrong agent in a Vapor 19.1 device. To fill a vaporizer with key indexed safety system, you must have the appropriate keyed bottle adapter for the anesthetic agent.

1. With the vaporizer in an upright position, turn the handwheel to “0” (zero-point interlock) and make sure the button engages in the locked position.

2. Remove the cap and seal from the anesthetic agent bottle. Check the sealing edge of bottle for chipping or other damage. DO NOT use if damaged.

3. Attach the keyed bottle adapter to the keyed collar on the bottle. Screw the parts together tightly to form an airtight seal.

4. Turn the filler port lock screw counterclockwise and remove the filler port plug from the filler port.

5. Insert the keyed adapter into the filler port of the vaporizer so that the two holes in the adapter face the Teflon seal surface of the filler port. Bend the filler tube so that the liquid level in the bottle is below the filler port. Adjust the plastic tubing to avoid kinks.

6. Turn the filler port lock screw clockwise to hold the adapter against the Teflon seal.

7. Open the filler valve by turning the knob counterclockwise two or three turns.

   CAUTION: Be sure to fill the vaporizer in an upright position; filling the vaporizer in a tilted position may cause overfilling. Overfilling may cause the anesthetic concentration rate to be higher or lower than the handwheel setting.

8. Lift the bottle above the filler port level, avoiding kinks in the plastic tube. The liquid should begin flowing within 10 seconds after raising the bottle. If liquid does not begin to flow within 10 seconds, move the bottle below filler port level and raise it above the filler port again. (This allows any air trapped in the tubing to escape.) Repeat as necessary to start the flow.

9. Watch the sight glass while the vaporizer is filling, and close the filler valve when the liquid level reaches the lower of the two marks at the upper end of the sight glass. The lower mark is the FULL mark; the upper mark is the OVERFLOW mark.

   NOTE: The capacity of the vaporizer is approximately 140 cm^3 with wet wick, and approximately 200 cm^3 with dry wick.

10. Remove the adapter from the filler port.

11. Allow excess liquid to drain from the filler port.

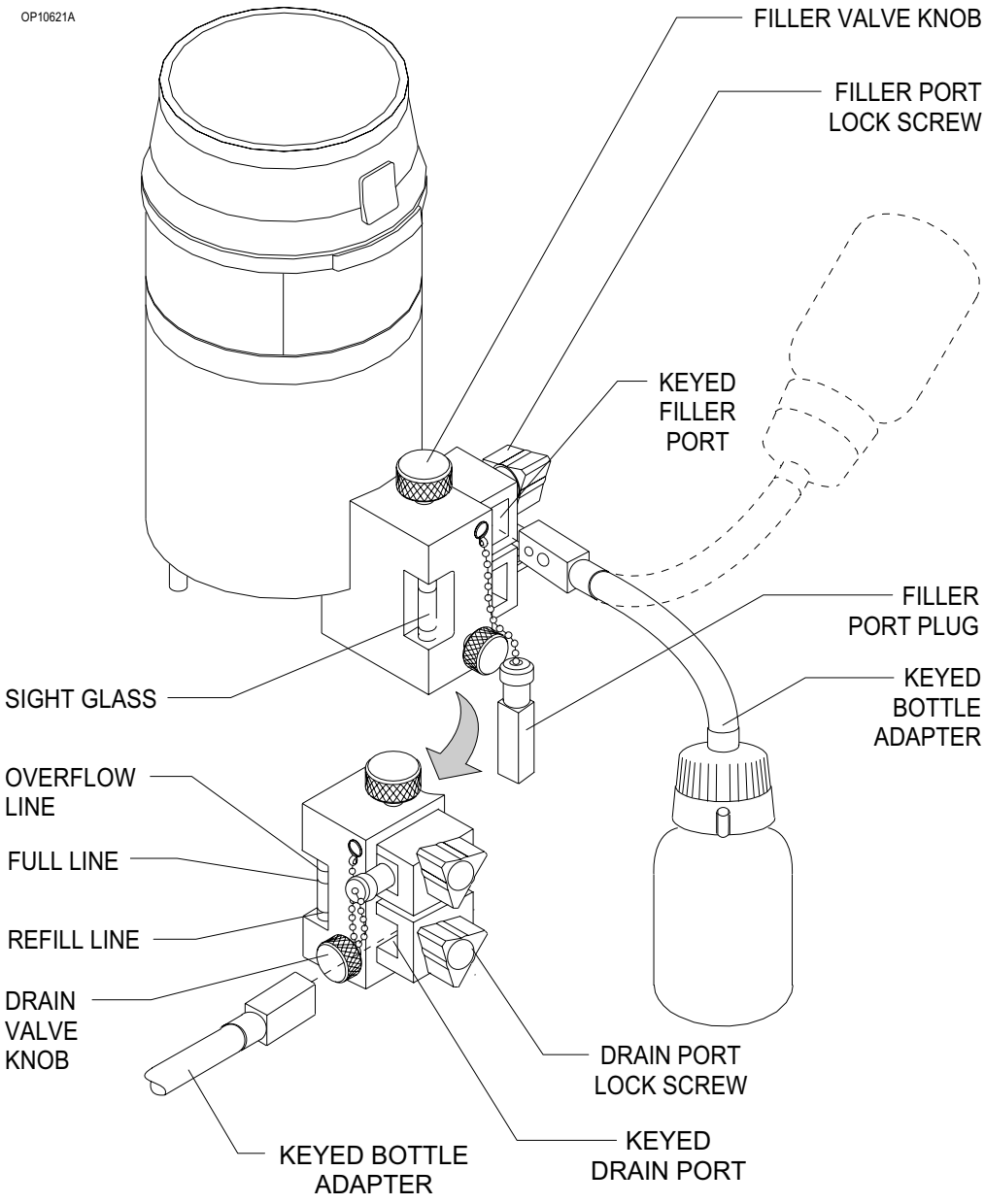
12. Fully insert the filler port plug in the filler port and tighten the plug in place by turning the lock screw clockwise.

13. After filling, check the level at the sight glass. When the vaporizer is in an upright position, the level must not exceed the FULL mark.

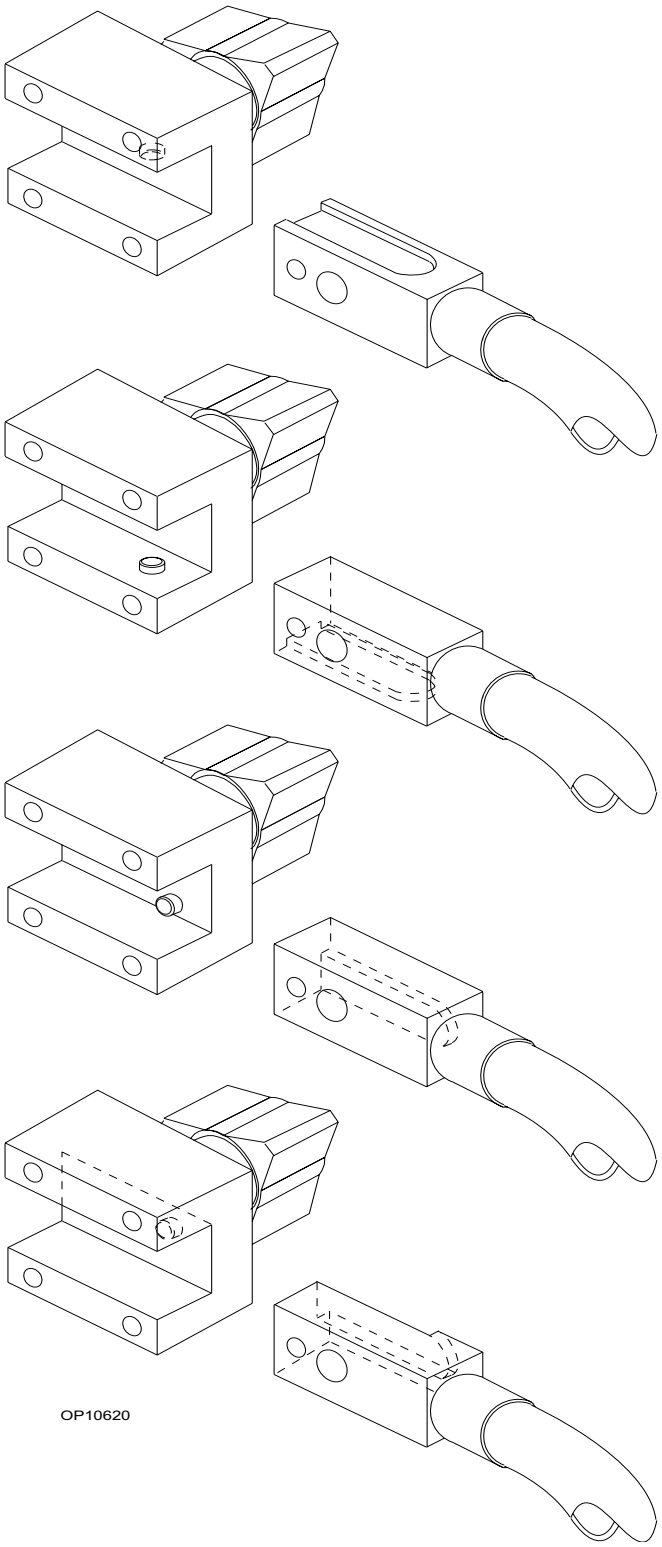
    If the vaporizer is inadvertently overfilled (FULL mark exceeded), drain the excess anesthetic. For information on draining the vaporizer, refer to “Draining Vaporizer with Key Indexed Safety System” later in this section.

14. Remove the adapter from the bottle.

15. Place the cap back on the bottle.


OP10621A
FILLER VALVE KNOB
FILLER PORT LOCK SCREW
KEYED FILLER PORT
FILLER PORT PLUG
KEYED BOTTLE ADAPTER
SIGHT GLASS
OVERFLOW LINE
FULL LINE
REFILL LINE
DRAIN VALVE KNOB
DRAIN PORT LOCK SCREW
KEYED DRAIN PORT
KEYED BOTTLE ADAPTER

Section 5 - Operation
Vaporizer



HALOTHANE
(RED)

ENFLURANE
(ORANGE)

ISOFLURANE
(PURPLE)

SEVOFLURANE
(YELLOW)

Draining the Vaporizer

Before draining a vaporizer, identify the filling system on the device as one of the following:

- Open funnel system
- Key indexed safety system

When you have identified the filling system, locate the appropriate procedure and read it entirely before draining the device.

WARNING: Do not inhale anesthetic vapors while draining the vaporizer. Uncontrolled inhalation of anesthetic vapors is injurious to health.

Draining Vaporizer With Open Funnel Spout

1. With the vaporizer in an upright position, turn the handwheel to “0” (zero-point interlock) and make sure the button engages in the locked position.
2. Place an empty anesthetic-specific bottle under the drain hole of the filling spout. Mark the bottle to indicate that it contains a previously used anesthetic agent.

   WARNING: The vaporizer handwheel must be set to “0” (zero-point interlock) before the vaporizer can be drained.

3. Open the drain valve by turning it counterclockwise about three turns. Do not unscrew the valve completely.
4. Close the drain valve.

   WARNING: Do not re-use drained agent.

5. Place the cap back on the bottle and dispose of the bottle in accordance with approved hospital procedures.

Section 5 - Operation
Vaporizer

Draining Vaporizer With Key Indexed Safety System

The key indexed safety system employs a matching pin-and-socket assembly to prevent inadvertent use of the wrong agent in a Vapor 19.1 device. To drain a vaporizer with key indexed safety system valves, you must have the appropriate keyed bottle adapter for the anesthetic agent.

1. With the vaporizer in an upright position, turn the handwheel to “0” (zero-point interlock) and make sure the button engages in the locked position.

2. Attach the keyed bottle adapter to the appropriate empty bottle. Tighten to assure airtight seal. Mark the bottle to indicate that it contains a previously used anesthetic.

3. Insert the bottle adapter fitting into the drain port of the vaporizer. The two holes in the adapter fitting must face the Teflon seal surface in the drain port.

4. Turn drain port lock screw clockwise to hold the adapter against the Teflon seal.

   WARNING: The vaporizer handwheel must be set to “0” (zero-point interlock) before the vaporizer can be drained.

5. Hold the bottle below drain port level, and avoid kinking the plastic tube. Open the drain valve by rotating the knob counterclockwise. Allow the liquid to drain into the bottle until the vaporizer is empty. The vaporizer is empty when no anesthetic flows from the drain.

6. Close the drain valve and remove the adapter from the drain port.

   WARNING: Do not re-use drained agent.

7. Place the cap back on the bottle and dispose of the bottle in accordance with approved hospital procedures.

Section 5 - Operation
Absorber System

REFER TO SEPARATE MANUAL

RETURN TO CD-ROM TABLE OF CONTENTS

Section 5 - Operation
Bain Circuit Adapter

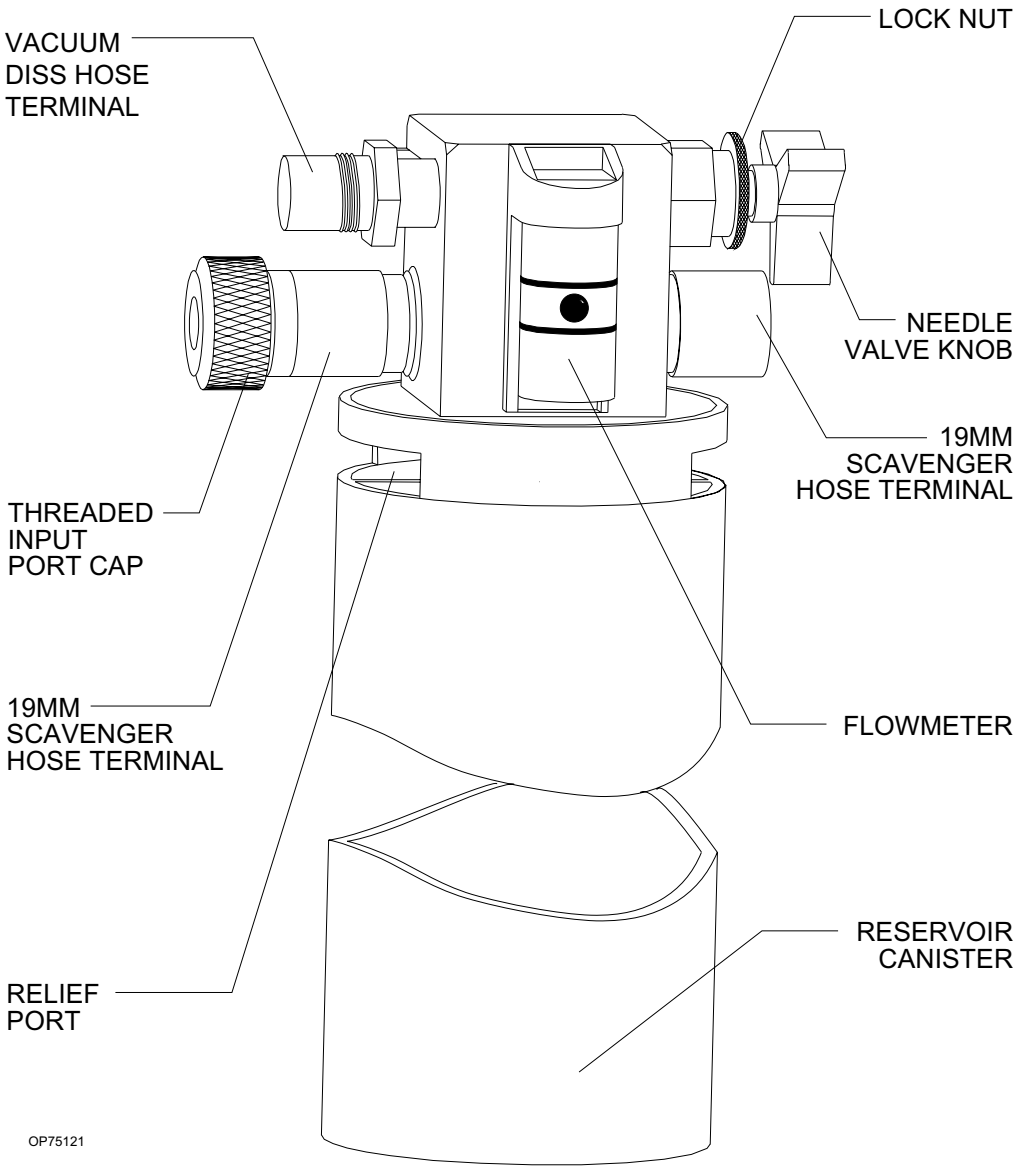
REFER TO SEPARATE MANUAL

RETURN TO CD-ROM TABLE OF CONTENTS

Section 5 - Operation
Open Reservoir Scavenger

Overview

The open reservoir scavenger is intended for use with suction (vacuum) waste gas disposal systems. This scavenging approach applies a continuous suction to transfer waste gas from the scavenger to the disposal system. The open reservoir scavenger is an “open” system, which uses continually open relief ports to provide positive and negative pressure relief.



Section 5 - Operation
Open Reservoir Scavenger

Connecting the Open Reservoir Scavenger System

The open reservoir scavenger system is installed on the Narkomed 4 before shipping. The only thing you need to do before operating the scavenger is to make the hose connections.

CAUTION: Do not attempt to force 19 mm scavenger hoses over 22 mm breathing hose terminals. Carefully follow the hose connection instructions for installing the scavenger and the absorber.

To connect the scavenger hoses:

1. Attach a 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the bottom of the absorber pole and the 19 mm terminal (marked SCAVENGER HOSE) on the right side of the scavenger.

   WARNING: Make sure the 19 mm scavenger hoses leading from the absorber are not pinched, kinked, or blocked in any manner.

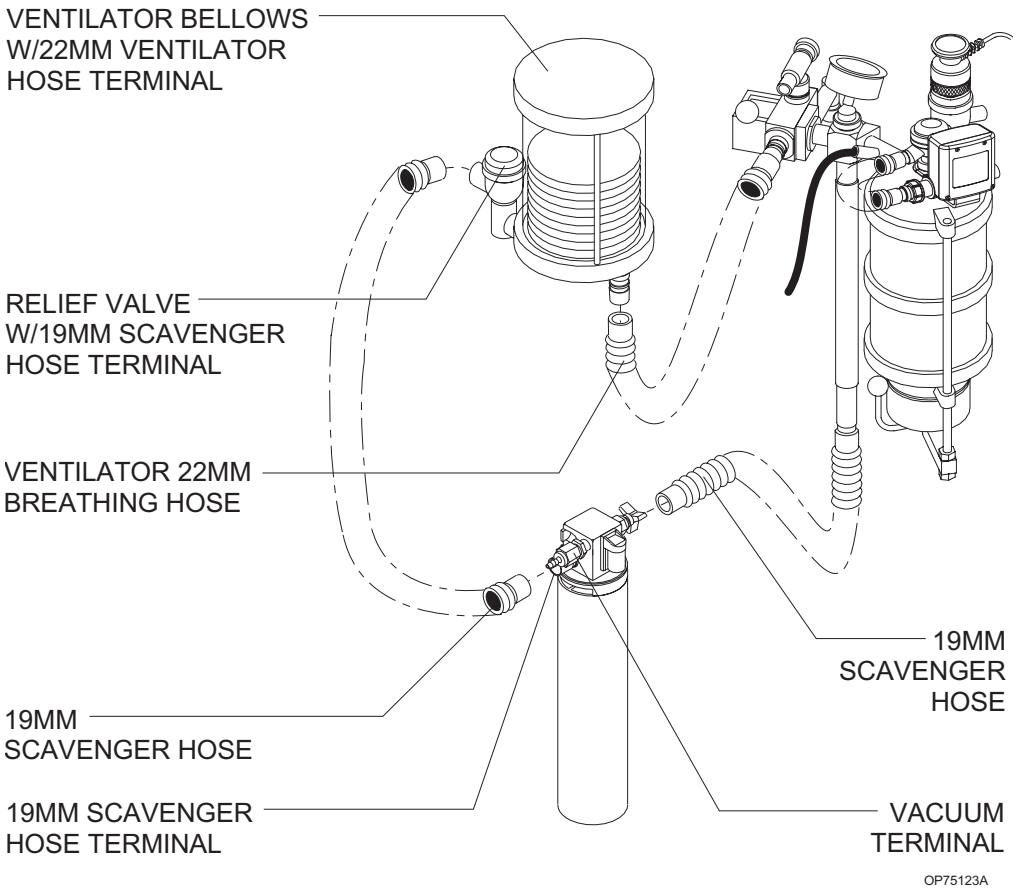
2. Attach the short 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the rear of the APL valve and the 19 mm terminal (marked SCAVENGER HOSE) on the rear of the absorber pole.

3. Attach another 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the ventilator relief valve and the 19 mm terminal (marked SCAVENGER HOSE) on the left-hand side of the scavenger.

   WARNING: Make sure the 19 mm scavenger hose leading from the ventilator relief valve is not pinched, kinked, or blocked in any manner.

4. Attach a wall suction hose between the wall suction outlet and the suction terminal (DISS or hose barb with adapter) on the scavenger.

5. Verify the proper functioning of the scavenger system.



Operating the Open Reservoir Scavenger System

Because the open reservoir scavenger's reservoir canister is open to the atmosphere, it does not require spring-loaded relief valves. If the waste gas flow rate from the patient breathing system exceeds the disposal system's suction flow rate, the canister initially accommodates excess waste gas. After excess waste gas fills the canister, waste gas then exits through the relief ports around the top of the canister. Thus, positive pressure does not build up within the patient breathing system.

CAUTION: Waste gas vented from the relief ports may contaminate the operating room. To prevent such contamination, be sure to adjust the needle valve properly.

If the disposal system's flow rate (suction) exceeds the waste gas flow rate from the patient breathing system, the disposal system draws room air through the relief ports. Thus, the disposal system does not apply a negative pressure to the patient breathing system.

Section 5 - Operation
Open Reservoir Scavenger

Adjusting the Needle Valve

You must properly adjust the waste gas flow rate to prevent waste gas contamination of the operating room. The needle valve wing nut regulates the waste gas exhaust flow.

To adjust the needle valve:

1. Attach all appropriate hoses and verify that the waste gas disposal system is active.

2. Turn the needle valve wing nut until the flowmeter indicates a flow halfway between the two white lines etched on the scavenger's flowmeter. This setting corresponds to a suction flow rate of about 25 l/min.

Depending on the fresh gas flow rate, the needle valve setting may have to be increased or decreased to settings either above or below the lines on the flowmeter. If the suction flow rate is set too low, waste gas will exit the canister through the relief ports around the top of the canister and contaminate the operating room. If the suction flow rate is too high, the waste gas disposal system's suction capacity will be needlessly depleted and the system will be noisy.

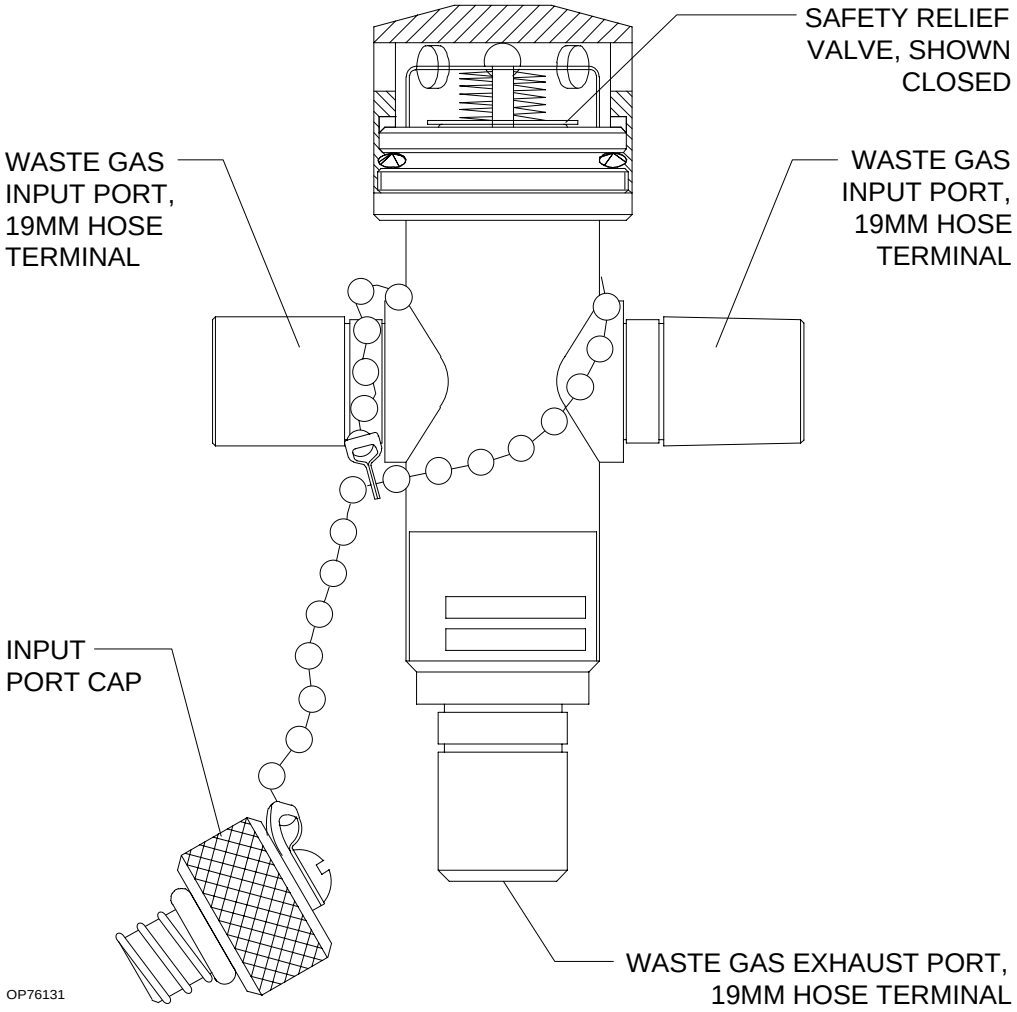
You may have to readjust the needle valve setting during a case. For example, a shared suction disposal system may provide a varying suction flow rate, depending on the number of users at any given time.

Section 5 - Operation
Scavenger Interface for Passive Systems

Overview

The Scavenger Interface for Passive Systems is intended for use with nonrecirculating HVAC systems (also called exhaust systems). This scavenging approach relies on the pressure of the waste gas itself to transfer the gas from the scavenger to the disposal system. The scavenger interface is a “closed” system, which uses a spring-loaded valve for positive pressure relief.

WARNING: Do not use this device with a waste gas disposal system capable of applying a negative pressure to the scavenger interface (a suction or vacuum waste gas disposal system).

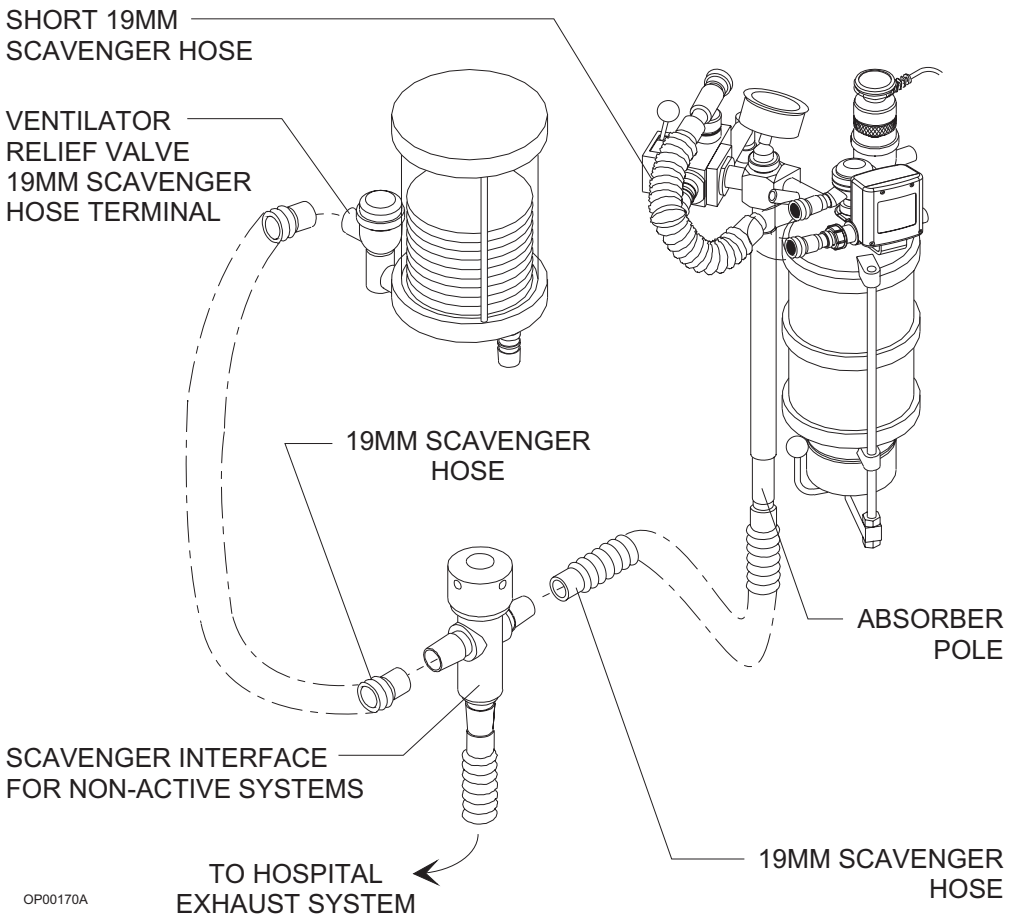

SAFETY RELIEF VALVE, SHOWN CLOSED
WASTE GAS INPUT PORT, 19MM HOSE TERMINAL
WASTE GAS INPUT PORT, 19MM HOSE TERMINAL
INPUT PORT CAP
WASTE GAS EXHAUST PORT, 19MM HOSE TERMINAL
OP76131

Section 5 - Operation
Scavenger Interface for Passive Systems

Operating the Scavenger Interface for Non-active Systems

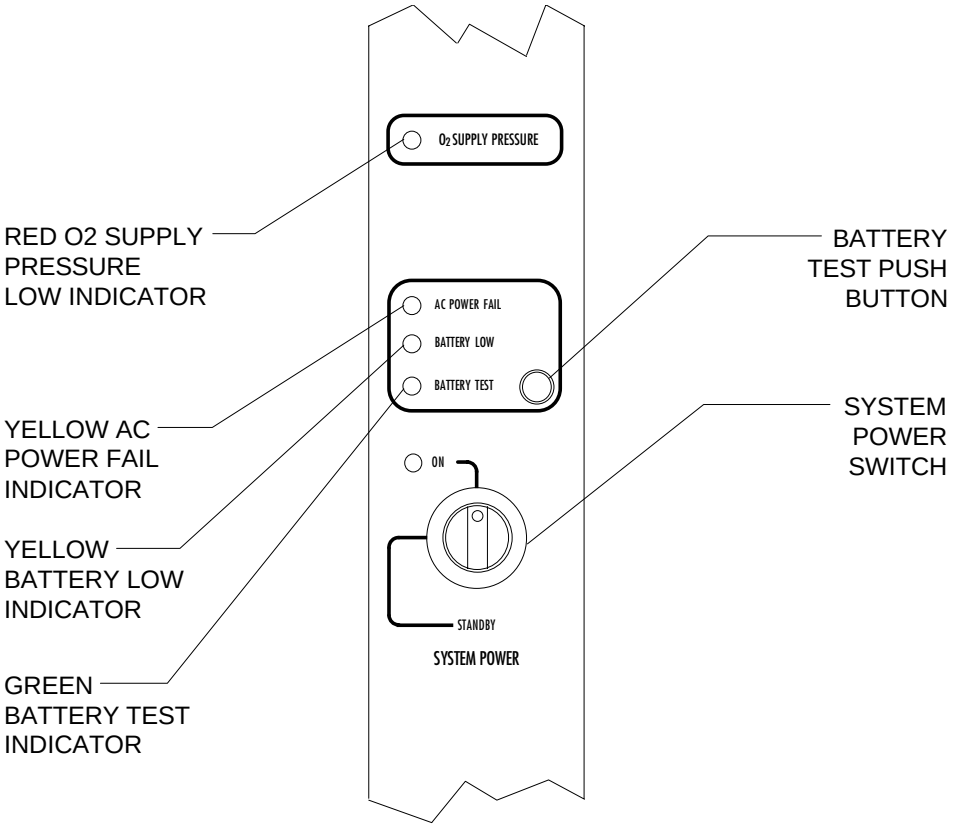
In a typical anesthesia circle system, waste gas exits form the breathing system APL or ventilator relief valves and passes through the scavenger to the exhaust system. If the hospital exhaust system stopped functioning (or if the path between the scavenger and the exhaust system becomes blocked), positive pressure would build up within the scavenging and breathing systems. To prevent such a harmful pressure build-up, the scavenger's positive pressure relief valve is set to open at a pressure of 5 cmH_2O. Waste gas then exits through the holes in the relief valve housing. Therefore, you do not have to adjust this scavenger. You must, however, make sure that hoses are properly connected and that the positive pressure safety relief valve is functioning.

WARNING: The positive pressure relief valve must be inspected and cleaned (if necessary) at six month intervals.



Overview

The main switch panel, located between the ventilator bellows and flowmeter bank, incorporates the SYSTEM POWER switch and indicator lights for low O_2 supply pressure, AC power failure, and battery low alarms. These alarms are annunciated and displayed on the monitor screen's alarm window.



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System Power Switch

The SYSTEM POWER switch on the Narkomed 4 has two positions: ON and STANDBY. In the ON position the gas (pneumatic) and electric power circuits are activated and the green LED indicator adjacent to the switch is illuminated. In the STANDBY position the gas supplies, the monitoring system, and all electrical power to the machine except the convenience receptacles and battery charging circuit are deactivated.

NOTE: The battery charging circuit and convenience receptacles are active whenever the power cable is attached to an active wall receptacle, regardless of the switch setting.

Testing the Battery

The backup battery system shall be tested daily. To test the battery:

1. Turn the SYSTEM POWER switch ON, and wait until the power-on diagnostic screen is no longer displayed.
2. Remove the machine's power plug from the electrical outlet.
3. Press and hold the BATTERY TEST button.
4. If the battery is sufficiently charged, the green BATTERY TEST light illuminates after a short delay.

Usually, a fully charged battery can power the electrical components of the anesthesia machine for at least 30 minutes in the event of a power failure.

NOTE: During an AC power loss, the BATTERY LOW indicator is illuminated when the battery reserve approaches depletion. However, do not rely solely on this indicator for an assessment of battery capacity. If the backup battery becomes completely depleted and the machine does not have AC power, the BATTERY LOW indicator light has no source of power and does not function. Therefore, always remember to perform the pre-use battery test.

To prevent premature battery failure, use backup battery power only during interruption of primary AC power. Do not start an anesthetic procedure on the anesthesia machine if the AC POWER FAIL indicator light or the BATTERY LOW indicator light is illuminated.

Overview

The AV2+ anesthesia ventilator is a volume preset, time cycled, pressure limited ventilator with electronic timing, pneumatic circuitry and independent controls for frequency, inspiratory to expiratory (I:E) ratio, inspiratory flow rate, tidal volume, and inspiratory pressure limit.

Pneumatic power (bellows drive gas) to the ventilator is supplied through the hospital pipeline supply or through reserve cylinders on the anesthesia machine. The pressure of the supply gas must be between 40 and 60 psi. The ventilator will not function if this pressure drops below 32 psi. Electrical power is supplied by the Narkomed 4's AC power source, or, in event of AC power failure, by the backup battery. A fully charged battery can power the ventilator for approximately 20 minutes.

The anesthesia ventilator is designed for use with a North American Dräger absorber system, which incorporates a manual/automatic selector valve. This valve allows you to select either the breathing bag and adjustable pressure limiter (APL) valve for manual ventilation, or the ventilator bellows for automatic ventilation.

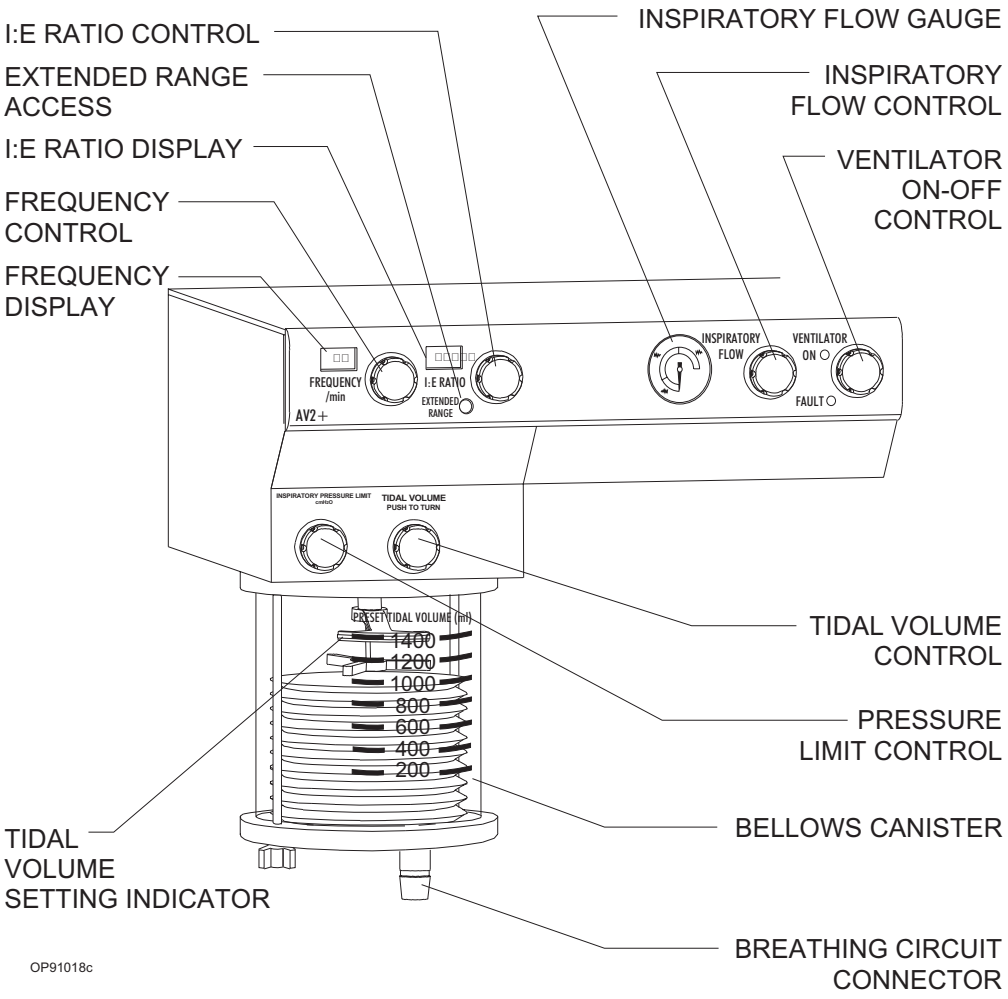
During automatic ventilation, the manual/automatic selector valve isolates the absorber's APL valve from the breathing system. To compensate for the continuous introduction of fresh gas into the breathing system, the ventilator incorporates a relief valve mounted behind the bellows chamber.

When the bellows is completely filled, any excess gas in the system is released to the scavenging system through the ventilator relief valve. As in any ascending bellows, the force needed to overcome gravity acting on the bellows causes a positive end-expiratory pressure (PEEP) within the breathing system. For the Narkomed 4, the PEEP is approximately 2 cmH_2O.

The monitoring system's breathing pressure and expiratory flow waveform displays can be used as an aid in adjusting the ventilator and establishing alarm criteria.

WARNING: Regardless of the indications of any alarm or monitoring device, patient chest movement shall be the primary indication of a securely connected, properly ventilated patient.

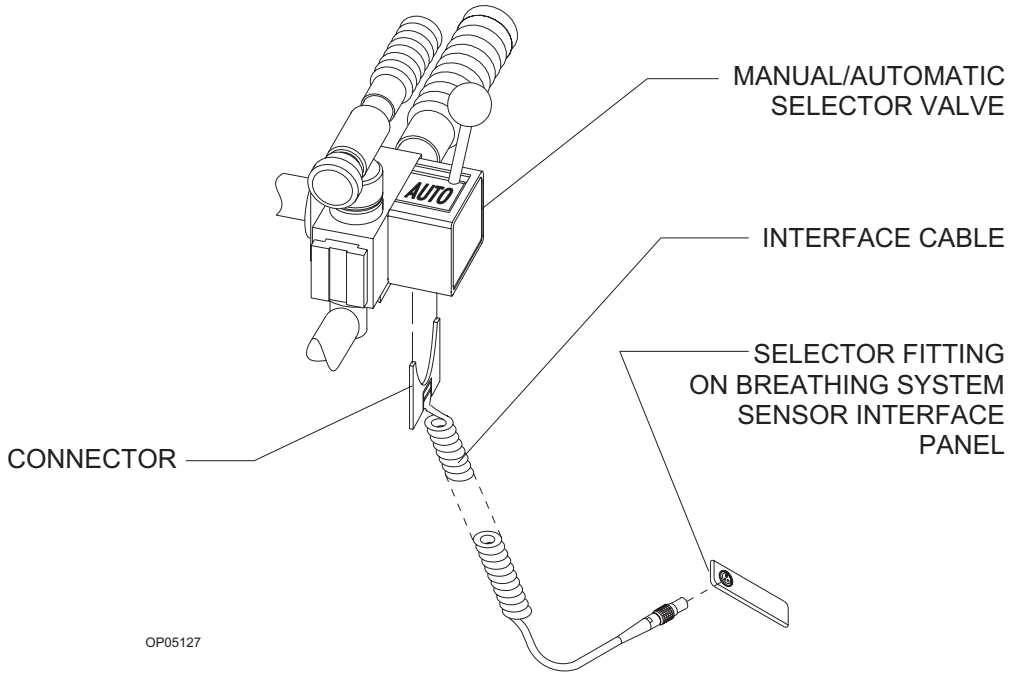
A front view of the AV2+ anesthesia ventilator is shown in the following figure.



Activating the Ventilator

The ventilator can be activated by using the ventilator on/off control, or, optionally, by using the lever on the manual/automatic selector valve. The anesthesia machine's SYSTEM POWER switch must be set to ON in order for the ventilator to function.

NOTE: The selector valve lever can activate the ventilator only when the interface cable is connected between the manual/automatic selector valve and the SELECTOR fitting on the breathing system sensor interface panel (see following illustration); when the interface cable is disconnected, the position of the selector lever has no effect on the ventilator.



When the ventilator is activated, both pneumatic and electric power to the ventilator are turned on, and the monitoring system's volume and pressure alarms are automatically enabled. When the ventilator is turned off, the FREQUENCY and I:E RATIO displays remain lighted, but the ventilator will not function.

Using the Ventilator On/Off Control

The ventilator on/off control is a momentary switch that returns to its center position after being turned in either direction.

- To activate the ventilator, turn the switch clockwise; the green ON indicator is then turned on and the switch returns to its center position.

  NOTE: The ventilator can only be activated when the manual/automatic selector valve is in the AUTO position (with the interface cable between the selector valve and interface panel connected). If you attempt to activate the ventilator with the selector lever in the BAG position, the yellow FAULT indicator on the ventilator bezel will be turned on, indicating a fault condition.

- To shut down the ventilator, turn the switch counterclockwise; the green ON indicator is then turned off and the switch returns to its center position.

Using the Manual/Automatic Selector Valve Lever

The ventilator can be turned on and off with the selector lever on the manual/automatic selector valve (with the interface cable between the selector valve and interface panel properly connected).

NOTE: When you operate the lever, let it snap into position. Do not hold back on the lever; preventing its free movement could damage the ventilator's sensors.

- To activate the ventilator, move the manual/automatic selector valve lever to the AUTO position; the green ON indicator on the ventilator bezel is then turned on.
- To shut down the ventilator, move the manual/automatic selector valve lever to the BAG position; the green ON indicator on the ventilator bezel is then turned off.

Adjusting the Tidal Volume

The tidal volume is adjusted using a self-locking knob, located above the bellows assembly. The control knob positions a stop within the bellows canister which limits the upward travel of the bellows and thus sets the maximum tidal volume of gas delivered to the patient. To adjust the tidal volume, press the self-locking knob so that it can turn, then set the desired tidal volume as shown by the setting indicator on the bellows chamber scale (marked 200–1400 ml). The tidal volume can be adjusted to achieve volumes between 20 and 1500 ml.

Smaller tidal volumes can be adjusted by setting the pointer below the 200 ml marking on the bellows chamber; larger tidal volumes can be selected by setting the pointer above the 1400 ml calibration.

As in any volume-preset anesthesia ventilator, the actual tidal volume delivered to the patient's lungs may differ from the preset volume at the bellows due to the compliance of the breathing system and fresh gas flow. To accurately set the tidal volume, refer to the tidal and minute volume measurements.

The position of the tidal volume indicator can be calibrated for a specific combination of fresh gas flow and equipment compliance by a North American Dräger qualified technical service representative.

Setting the Respiratory Frequency

Use the frequency control knob to set the respiratory frequency from 1 to 99 breaths per minute (BPM) in 1 BPM increments.

Clockwise rotation of the control knob increases the frequency setting, while counterclockwise rotation decreases the frequency setting.

Setting the Inspiratory/ Expiratory (I:E) Phase Time Ratio

Use the I:E ratio control knob to set the inspiratory/expiratory (I:E) phase time ratio. The standard range of ratios is from 1:1 through 1:4.5, adjustable in increments of 0.5.

An extended range of ratios is also available which allows the setting of inverse I:E ratios. The specific extended range settings are: 4:1, 3:1, and 2:1. The extended range settings are accessible by pressing the EXTENDED RANGE switch while rotating the I:E ratio control knob.

Clockwise rotation of the control knob increases the I:E ratio setting, while counterclockwise rotation decreases the I:E ratio setting.

WARNING: The use of inverse I:E ratios will introduce auto-PEEP.

Setting the Inspiratory Flow Rate

Use the inspiratory flow control knob to set the inspiratory flow in the range of 10 l/min to 100 l/min. This setting controls the flow rate of gas into the bellows canister, and thus the flow rate of gas delivered to the patient.

Because of patient circuit variables such as lung compliance, fresh gas flow, airway resistance and equipment compliance, the flow gauge is labeled with nominal zones of LOW, MEDIUM, and HIGH.

You should adjust the flow setting to a point where the ventilator bellows is fully compressed (but not deformed) at the end of the inspiratory phase of the breathing cycle.

You can also use the inspiratory flow control to create an inspiratory plateau at the end of the inspiratory cycle and to affect the potential peak inspiratory pressure within the patient breathing system. Always check the pressure indicated by the breathing system pressure gauge and waveform when adjusting the inspiratory flow control.

Setting the Inspiratory Pressure Limit

The pressure limit control, located above the bellows canister, is used to adjust the pressure limit. Nominal pressure zones are indicated by the label. This control determines the maximum pressure that can be delivered by the ventilator during the inspiratory phase of the respiratory cycle. Because of patient circuit variables, the scale on the label is only a reference; the pressure should be read from the breathing system pressure gauge or the anesthesia machine's pressure monitoring system.

When the pressure limit control is turned fully counterclockwise, the peak inspiratory pressure will be less than or equal to 15 cmH_2O. When the control is turned fully clockwise, the peak inspiratory pressure will be less than or equal to 120 cmH_2O.

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
Excessive PEEP	Improperly adjusted ventilator relief valve	Contact NAD qualified technical service representative.
	Insufficient suction scavenger flow setting	Increase suction scavenger flow valve.
	PEEP valve active	Decrease PEEP valve setting.
	Inverse I:E ratios	Reset ratios.
Excessive NEEP	Excessive suction scavenger flow	Reduce suction scavenger flow rate.
Bellows won't reach tidal volume stop setting during expiration	Frequency too high for selected tidal volume	Decrease frequency.
		Increase expiratory phase time.
	Improperly adjusted ventilator relief valve	Contact NAD qualified technical service representative.
	Breathing system leak	Repair leak.
Ventilator won't cycle	Low oxygen supply pressure	Provide sufficient oxygen supply pressure.
Moving manual/ automatic selector valve lever to AUTO position does not activate ventilator.	SYSTEM POWER switch is in STANDBY position	Turn SYSTEM POWER switch to ON.
	Interface cable is not connected	Connect interface cable.

PROBLEM	POSSIBLE CAUSE	REMEDY
Ventilator does not operate; yellow FAULT LED on ventilator lights	Selector switch on the absorber is in the BAG position	Turn the selector switch on the absorber to the AUTO position.
Bellows won't compress during inspiration	Absorber manual/ automatic selector valve in BAG position	Place selector valve in AUTO position.
	Inspiratory flow control setting on ventilator too low	Increase inspiratory flow control setting.
	Frequency too high	Decrease frequency.
	Inspiratory pressure limit setting on ventilator too low	Increase inspiratory pressure limit setting.

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Section 5 - Operation Monitoring System

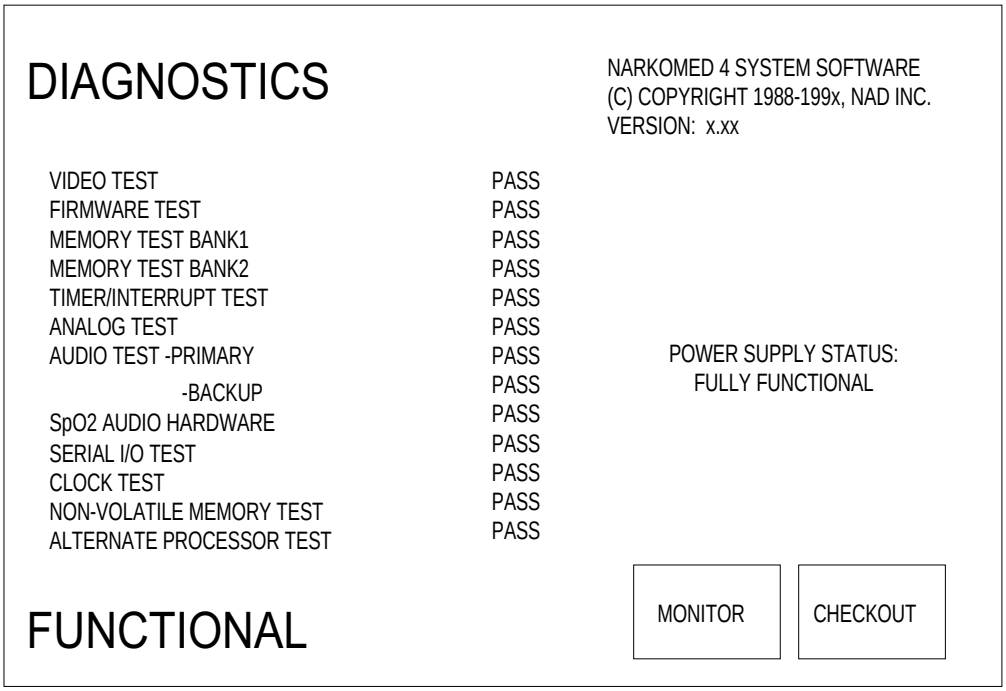
Overview

In addition to monitoring clinical parameters, the Narkomed 4 performs diagnostic self-tests every time the machine is turned on. After the initial power-on screen appears, you can display preuse checkout screens which list the items you should check before starting a case.

After power-on, you can invoke specific Narkomed 4 screens by pressing a key on the main key panel (along the right side of the main display). Each screen contains specific types of information and allows you to perform various operations. This section of the manual describes these screens and explains how to establish general monitoring settings. The last part of this section has information on using the Datagrip to access the remote display screens.

Power-On Screen

When you turn the SYSTEM POWER switch to the ON position, the Narkomed 4 performs extensive self-diagnostics on its internal hardware. As these diagnostics are performed, each test and its result appear on both main screens. The result, PASS or FAIL, indicates the status of the tested component. The last test reports the status of the Narkomed 4 backup processor. If the backup processor fails, press the BACKUP key to obtain a more detailed display of what is nonfunctional.



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NOTE: If the machine is equipped with the optional O.R. Data Manager, its self-diagnostics messages also appear briefly on the remote display.

The power supply status may be FULLY FUNCTIONAL, DC ON RESERVE, COMMUNICATIONS FAIL, BATTERY LOW, AC FAIL or a combination of these. The status of the power supply may effect the machine status.

At the end of the self-diagnostics, the Narkomed 4's status is posted in the lower left corner of the Power-On screen as one of the three following classifications:

- FUNCTIONAL - Every component of the machine is in satisfactory operational order.
- CONDITIONALLY FUNCTIONAL - A nonessential component of the machine is not functioning properly. The machine can be used, but a North American Dräger qualified technical service representative should be notified to correct the problem.
- NON-FUNCTIONAL - An essential component of the machine is malfunctioning which precludes operation of the monitoring system. Do not use the machine. Notify a North American Dräger qualified technical service representative immediately to correct the problem.

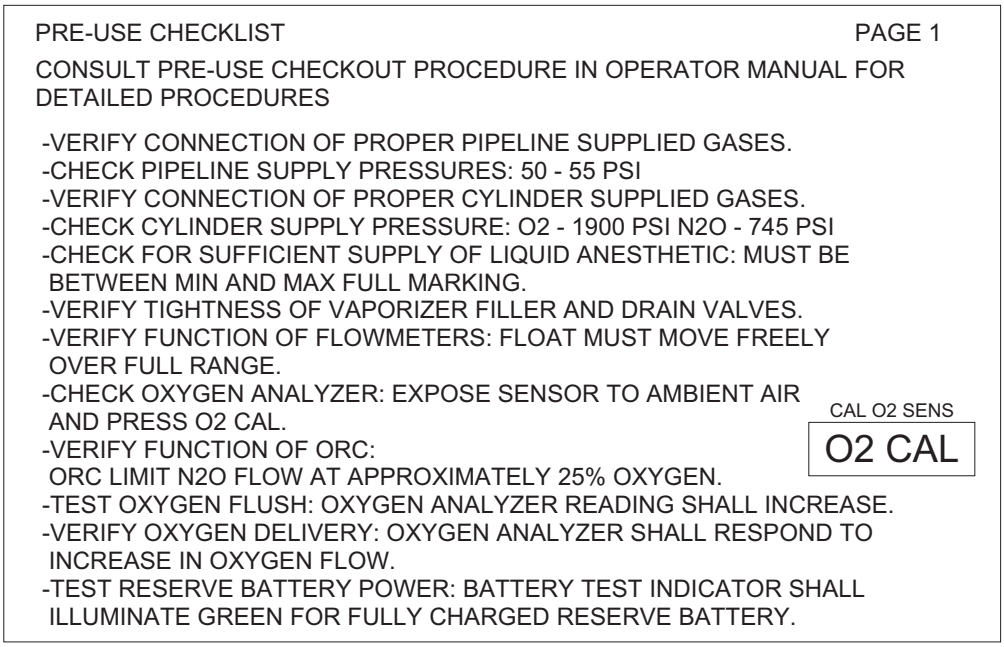
If the Narkomed 4 is functional or conditionally functional, two keys appear on the screen—MONITOR and CHECKOUT.

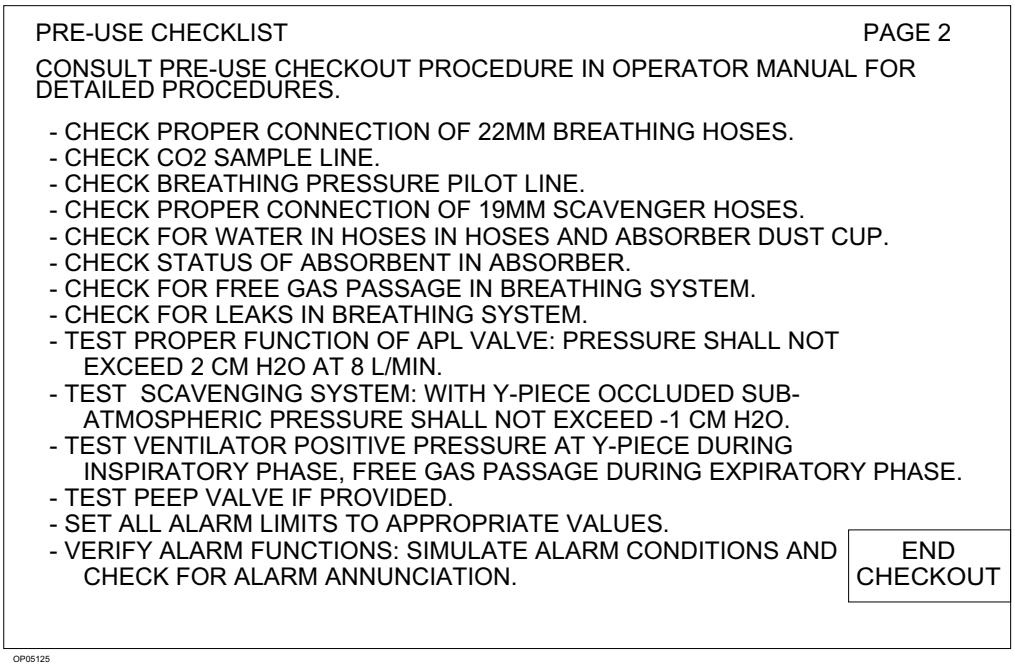
- To invoke the Monitor screen, touch the MONITOR key.
- To invoke the Preuse Checkout screen, touch the CHECKOUT key.

If you do not touch one of these keys within a set time-out period, the Monitor screen appears.

Invoking the Preuse Checkout Screen

To view the Preuse Checkout screen, touch the CHECKOUT key on the Power-On screen after the power-on diagnostics are complete. A condensed list of tests to be performed prior to the start of a case appears on the main display.


PRE-USE CHECKLIST
PAGE 1
CONSULT PRE-USE CHECKOUT PROCEDURE IN OPERATOR MANUAL FOR DETAILED PROCEDURES
-VERIFY CONNECTION OF PROPER PIPELINE SUPPLIED GASES.
-CHECK PIPELINE SUPPLY PRESSURES: 50 - 55 PSI
-VERIFY CONNECTION OF PROPER CYLINDER SUPPLIED GASES.
-CHECK CYLINDER SUPPLY PRESSURE: O2 - 1900 PSI N2O - 745 PSI
-CHECK FOR SUFFICIENT SUPPLY OF LIQUID ANESTHETIC: MUST BE BETWEEN MIN AND MAX FULL MARKING.
-VERIFY TIGHTNESS OF VAPORIZER FILLER AND DRAIN VALVES.
-VERIFY FUNCTION OF FLOWMETERS: FLOAT MUST MOVE FREELY OVER FULL RANGE.
-CHECK OXYGEN ANALYZER: EXPOSE SENSOR TO AMBIENT AIR AND PRESS O2 CAL.
CAL O2 SENS
O2 CAL
-VERIFY FUNCTION OF ORC:
ORC LIMIT N2O FLOW AT APPROXIMATELY 25% OXYGEN.
-TEST OXYGEN FLUSH: OXYGEN ANALYZER READING SHALL INCREASE.
-VERIFY OXYGEN DELIVERY: OXYGEN ANALYZER SHALL RESPOND TO INCREASE IN OXYGEN FLOW.
-TEST RESERVE BATTERY POWER: BATTERY TEST INDICATOR SHALL ILLUMINATE GREEN FOR FULLY CHARGED RESERVE BATTERY.
OP11046A


PRE-USE CHECKLIST
PAGE 2
CONSULT PRE-USE CHECKOUT PROCEDURE IN OPERATOR MANUAL FOR DETAILED PROCEDURES.
- CHECK PROPER CONNECTION OF 22MM BREATHING HOSES.
- CHECK CO2 SAMPLE LINE.
- CHECK BREATHING PRESSURE PILOT LINE.
- CHECK PROPER CONNECTION OF 19MM SCAVENGER HOSES.
- CHECK FOR WATER IN HOSES IN HOSES AND ABSORBER DUST CUP.
- CHECK STATUS OF ABSORBENT IN ABSORBER.
- CHECK FOR FREE GAS PASSAGE IN BREATHING SYSTEM.
- CHECK FOR LEAKS IN BREATHING SYSTEM.
- TEST PROPER FUNCTION OF APL VALVE: PRESSURE SHALL NOT EXCEED 2 CM H2O AT 8 L/MIN.
- TEST SCAVENGING SYSTEM: WITH Y-PIECE OCCLUDED SUB-ATMOSPHERIC PRESSURE SHALL NOT EXCEED -1 CM H2O.
- TEST VENTILATOR POSITIVE PRESSURE AT Y-PIECE DURING INSPIRATORY PHASE, FREE GAS PASSAGE DURING EXPIRATORY PHASE.
- TEST PEEP VALVE IF PROVIDED.
- SET ALL ALARM LIMITS TO APPROPRIATE VALUES.
- VERIFY ALARM FUNCTIONS: SIMULATE ALARM CONDITIONS AND CHECK FOR ALARM ANNUNCIATION.
END CHECKOUT
OP05125

Calibrating the Oxygen Sensor

The Preuse Checkout screen contains an O2 CAL touch key used to initiate an oxygen sensor calibration. To calibrate the oxygen sensor correctly, make sure it is exposed only to room air during the entire calibration period. You should calibrate the oxygen sensor as part of the daily preoperative setup of the anesthesia equipment.

1. Remove the sensor assembly from the inspiratory valve dome and close off the dome with the inspiratory valve dome plug. (Do not disassemble the sensor assembly further.)

2. Expose the sensor to ambient air only (21% oxygen concentration) and allow it to stabilize for several minutes. To ensure an ambient air exposure, hold the sensor away from any open part of the breathing system.

3. With the sensor exposed only to room air, touch the O2 CAL key.

   Calibration begins.

4. View the monitor screen to track progress of the calibration.

   - During calibration, the oxygen concentration value disappears, and the message CAL IN PROGRESS is displayed in the oxygen display area.

   - Following successful calibration, the currently sensed oxygen concentration appears in the oxygen display area.

   Typically, calibration lasts less than 30 seconds. However, the time may vary depending on the amount of oxygen the sensor was exposed to before calibration.

Oxygen Exposure	Typical Calibration Time
21%	10 seconds
> 21%	up to 50 seconds

5. When the Narkomed 4 successfully completes the calibration, pull the inspiratory valve dome plug and reinsert the sensor assembly.

   If, at the end of the calibration period, the oxygen display area is blank, the calibration was not successful. (This condition is also indicated by the advisory messages O2 NOT CAL and O2 ALARMS OFF.) Refer to Section 5, “Operation, Oxygen Monitoring” for additional information.

6. To exit the Preuse Checkout screen and enter the Monitor screen, touch the END CHECKOUT key.

Main Key Panel

Use the main key panel to select Narkomed 4 screens. Below is a brief description of each key's function. Each screen is described in detail later in this section.

MONITOR — Invokes the Monitor screen. The Monitor screen is the main information display. It shows numerical data, trends, and waveforms for all monitors.

MONITOR SETUP — Invokes the Monitor Setup screen. This screen allows you to change alarm limits, begin or inhibit calibrations, and set up specific monitoring functions.

DATA — Invokes the Data screen, which displays additional measurements for recordkeeping or detailed analysis.

DATA LOG — Invokes the Data Log screen, which displays a tabular listing of previously logged events.

TREND — Invokes the Trend screen, which displays a detailed graphic representation of the history of selected measurements.

PRINT — Invokes the Print screen, which displays print options.

SYSTEM CONFIG — Displays a series of System Configuration screens, which let you customize the operation of the Narkomed 4.

BACKUP — Toggles the active processor between the Narkomed 4's two simultaneously running processor systems: primary and backup.

The Narkomed 4 has two processors so that if one processor develops a fault, the other can continue analyzing monitor functions. The processors are identical and receive the same sensor information from the monitoring subsystems. However, only one processor sends monitoring information to the screens at a time. The remote display shows which processor is in use (e.g. when the main processor is in use, MAIN appears on the display.)

To switch to the processor in reserve, press the BACKUP key on the main key panel. To return to the initial processor, press the key again. If the processor in use malfunctions, press this key. A North American Dräger qualified technical service representative should also be notified immediately.

Control Key Panel

The control key panel, located on both the main display and the remote display, consists of three keys that perform system functions:

Invokes an audio silence period on the Narkomed 4 for 60 seconds, or 120 seconds if pressed twice. If the remaining silence period is 15 seconds or greater when you press the key, the audio silence period advances to 120 seconds.

If a new alarm occurs during the silence period, a single tone pattern, corresponding to the urgency of the alarm, is sounded. The SILENCE message and the silence time remaining are displayed at the bottom of the Advisory section of the central alarm display. At the end of the silence period, audio annunciation will revert to normal operation if no Warning or Caution alarms are active at the end of the silence period.

If any Warning or Caution alarms are active in the last 10 seconds of the silence period, the monitor will automatically enter an extended silence period at the end of the original silence period. On entering the extended silence period, a single tone pattern, corresponding to the highest priority alarm still remaining, will be sounded. If a new alarm occurs during the extended silence period, it will be annunciated with a single tone pattern. At each 1 minute interval into the extended silence period, the highest priority alarm is annunciated once.

The maximum duration of the extended silence period is 3 minutes. The extended silence period will automatically end if the monitor has been clear of Warnings and Cautions for 10 seconds. When the extended silence period ends, audio annunciation will revert to normal operation.

Turns off volume and pressure-apnea alarms. If the ventilator is on, the volume alarms will be turned off, but the pressure-apnea alarm will remain on.

The function of the AUTOSET key is dependent on the Datascan Display setting in the Remote Display Configuration screen.

If the bar graph Datascan is selected, pressing the AUTOSET key sets the current measurements at the center line of the Datascan display and resets the endpoints.

If the numeric Datascan is selected, pressing the AUTOSET key resets the alarm limits according to the ALARM AUTOSET values (WIDE, NARROW, or OFF) set in the Remote Display Configuration screen.

For complete information on selecting the Datascan display and setting the alarm AUTOSET value, see "Invoking the Remote Display Configuration Screen" later in this section.

Invoking the Monitor Screen

MONITOR

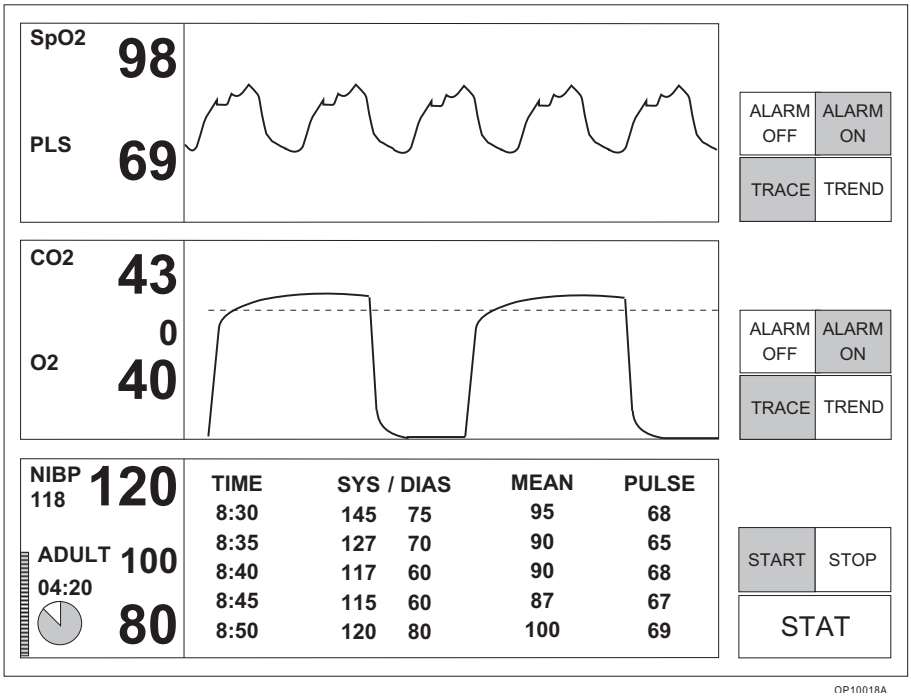
To invoke the monitor screen:

- Touch the MONITOR key that appears on the Power-On screen after diagnostics are complete. (The display automatically switches to this screen after a timed delay, once the power-on diagnostics are complete.)

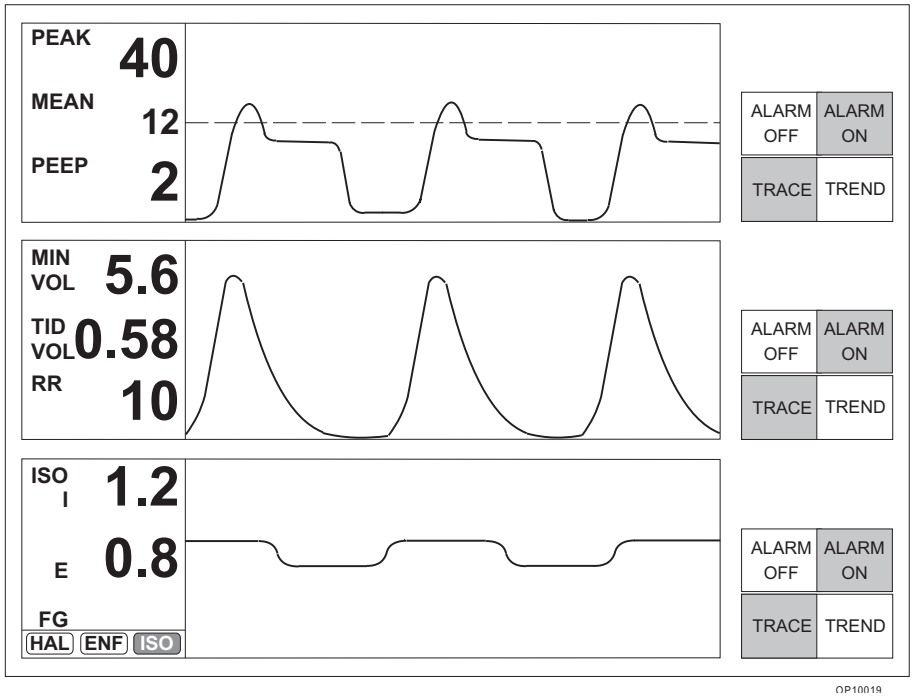
OR

- Press the MONITOR key on the main key panel.

The left side of the screen displays information for pulse oximetry, carbon dioxide and inspired oxygen, and noninvasive blood pressure.



The right side of the screen displays information for breathing pressure, respiratory flow and volume, and anesthetic agent.



Each monitoring display area is divided into three sections:

- numerical values for the current measurement.
- graphical trace or trend of the measurement (the NIBP section shows a tabular listing of the latest NIBP measurements in place of the trace or trend). In the trace mode, the center section may display a message window containing operational information.
- keys associated with the measurement (e.g. ALARM OFF/STBY, ALARM ON, TRACE, TREND). The area above the keys is reserved for displaying up to two alarm messages.

Section 5 - Operation
Monitoring System

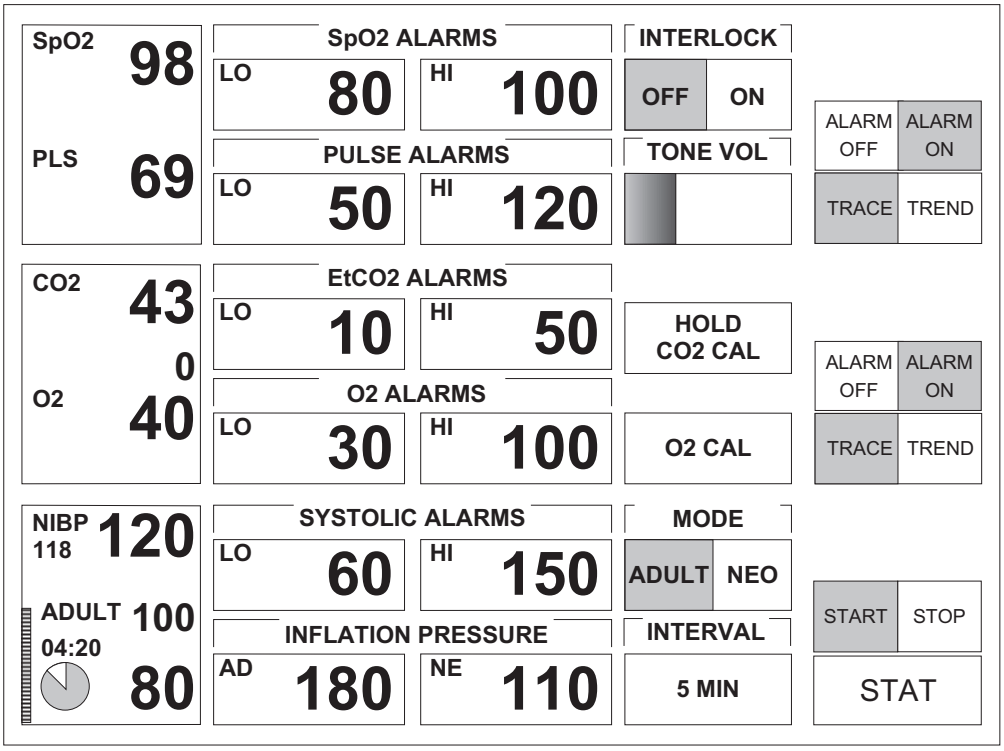
Invoking the Monitor Setup Screen

MONITOR SETUP

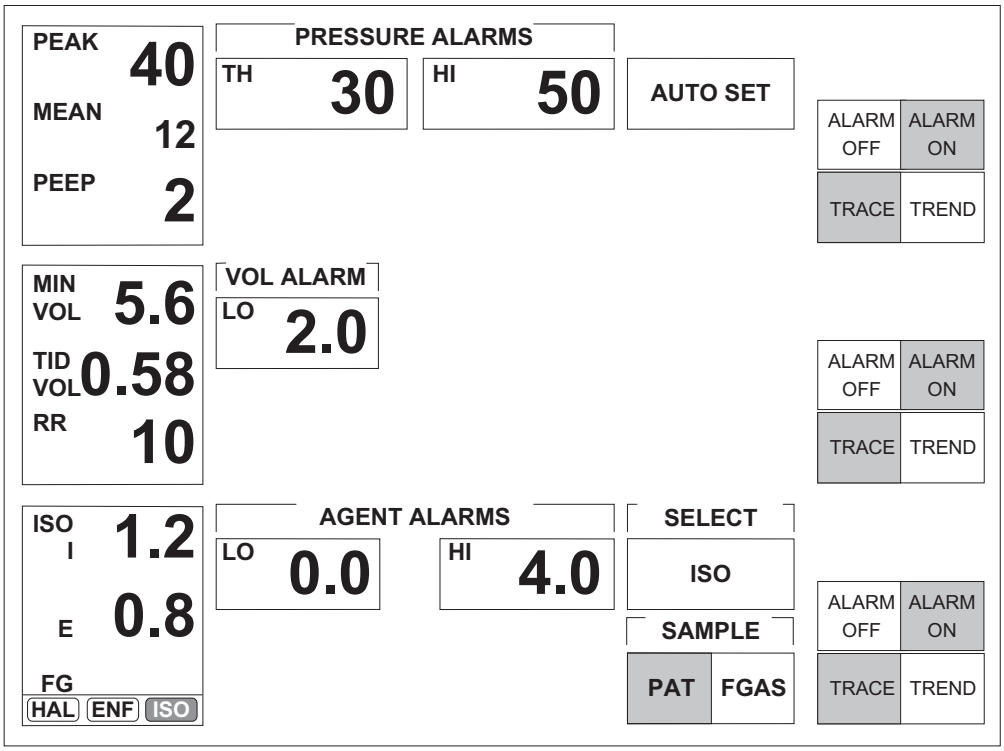
To invoke the Monitor Setup screen, press the MONITOR SETUP key on the main key panel.

The Monitor Setup screen allows you to change alarm limits, initiate or inhibit calibrations, and set various other selections. The Setup screen displays the current numerical data for each monitor, along with corresponding alarm limits and other changeable parameters.

The left side of the main display shows setup information for pulse oximetry, carbon dioxide and oxygen, and noninvasive blood pressure.



The right side of the main display shows setup information for breathing pressure, respiratory flow and volume, and anesthetic agent.



For information on setting individual alarm limits and other setup functions, see the operation section for the specific monitoring function.

Invoking the Data Screen

DATA

To invoke the Data screen, press the DATA key on the main key panel.

The Data screen, which is displayed on the right side of the main display, shows two kinds of information:

- breathing pressure measurements in the top section of the screen
- respiratory gas analysis **or** cardiovascular data in the bottom section of the screen

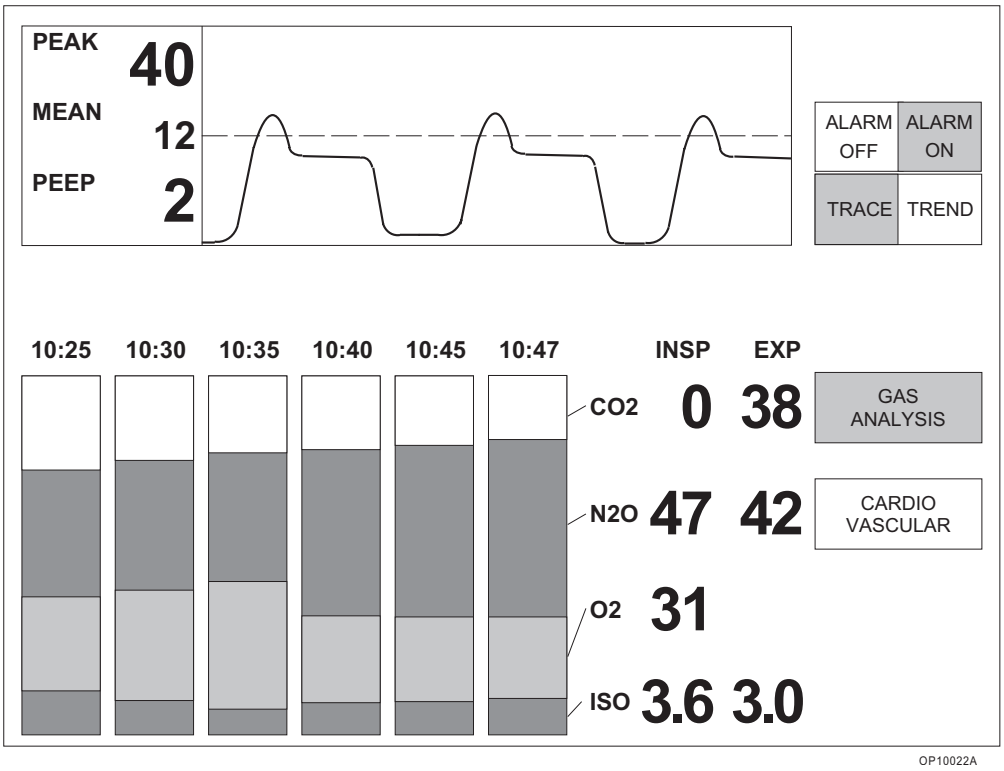
To select the information to be shown on the bottom portion of the screen, touch the key for the data you want displayed (GAS ANALYSIS or CARDIOVASCULAR).

Displaying Gas Analysis Data

To display gas analysis data, touch the GAS ANALYSIS key on the right side of the Data Screen.

The Gas Analysis Data screen shows both numerical values and bar charts of the respiratory gas concentrations. The bars are divided into five sections, each with a distinct pattern. The patterns represent inspired amounts of the following gases, from top to bottom:

- balance gas
- carbon dioxide
- nitrous oxide
- oxygen
- agent



There are six stacked bar charts. The left five bars display a history, in five-minute intervals, of the inspired gases' relative concentrations. The sixth bar gives the current concentrations.

Current inspiratory and expiratory values for the four monitored gases appear to the right of the bars. The values displayed are the usual units of measurement for that gas:

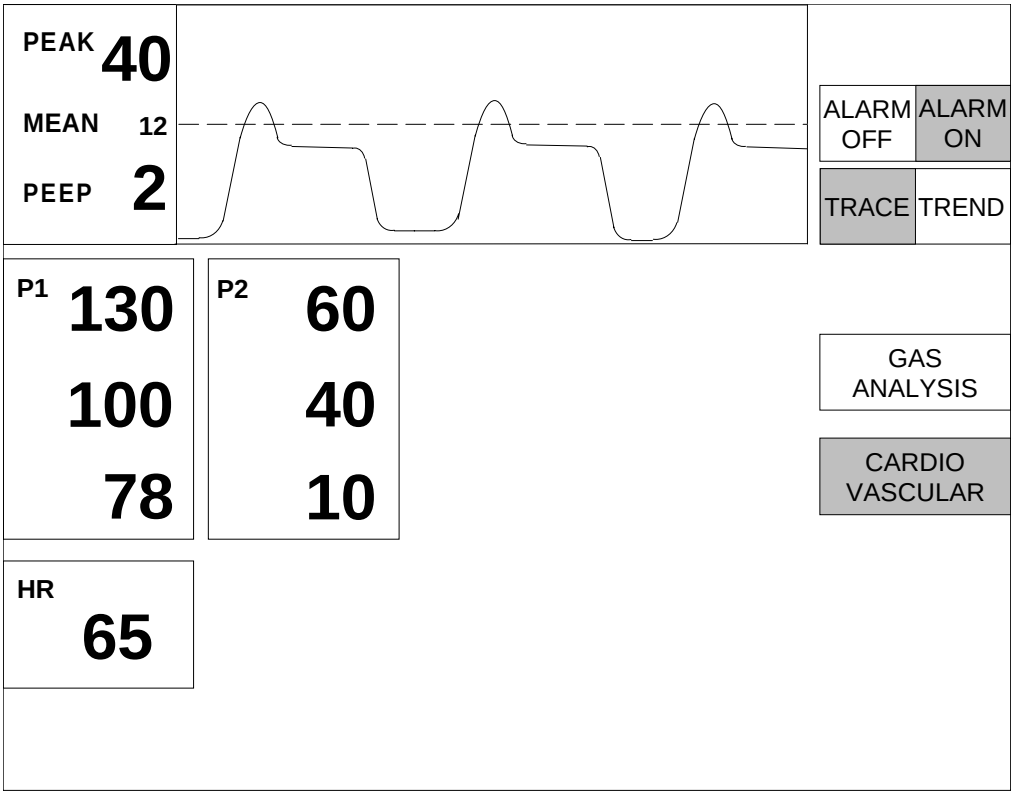
- carbon dioxide - mmHg, kPa, or %
- nitrous oxide - volume %
- oxygen - volume %
- anesthetic agent - volume %

Displaying Cardiovascular Data

To display cardiovascular data, touch the CARDIOVASCULAR key on the right side of the Data Screen.

The Cardiovascular Data screen displays cardiovascular data from a vital signs monitor (for example, the Vitalert 2000) interfaced to the Narkomed 4. The screen has three display areas:

- The P1 box displays systolic, diastolic, and mean arterial blood pressure measurements.
- The P2 box displays blood pressure measurements for central venous pressure, pulmonary artery pressure, or a second arterial blood pressure.
- The HR box displays the heart rate.



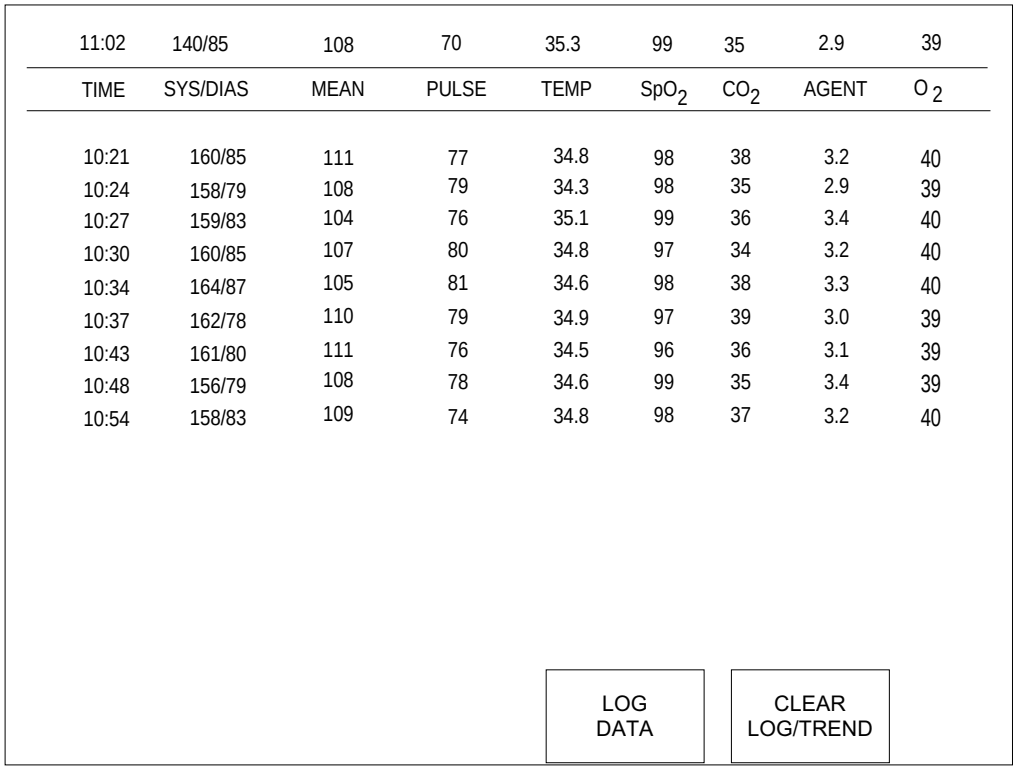
Section 5 - Operation
Monitoring System

Invoking the Data Log Screen

To invoke the Data Log screen, press the DATA LOG key on the main key panel.

DATA LOG

The Data Log is a tabular listing of measurements (called “events”) that are saved by the Narkomed 4 for future reference. It appears on the right side of the main display. Logged data is received from either the Narkomed 4 or from external monitors. If P1 and P2 readings are being received from an external monitor, those readings will be logged instead of the measurements taken by the Narkomed 4’s noninvasive blood pressure monitor. Up to 199 events can be stored in memory.



OP10024

The following measurements are logged:

- systolic/diastolic blood pressure
- diastolic blood pressure
- mean blood pressure
- pulse rate
- temperature
- oxygen saturation
- end-tidal carbon dioxide
- anesthetic agent
- oxygen concentration

The top line of the screen shows the current time and the current values for each measurement. Logged events with their time of occurrence are listed sequentially below the current values . You can scroll through the list of events on the Data Log screen with the selection dial.

Events can be entered manually or automatically. To enter events manually, touch the LOG DATA key at the bottom of the Data Log screen. If you want events to be entered automatically, make sure you have chosen the options you want for automatic entry. These options are:

- when a Warning alarm occurs
- when a Caution alarm occurs
- at each new NIBP reading
- at regular timed intervals

For more information on selecting options, see “Auto Log Configuration Screen” later in this section.

Logging Data Manually

To manually enter data into the Data Log for future reference:

1. Touch the LOG DATA key at the bottom of the screen.

2. The current data is recorded in the Data Log.

Clearing the Log/Trend

You can clear the logs (the data log and the NIBP log) and trend to erase all the previous data stored in the Narkomed 4’s memory. Typically, you clear the trend and logs at the beginning of a procedure before connecting the patient to the monitors. This clears the buffer of old data accumulated during the setup and checkout of the equipment.

To clear the data log, NIBP log, and trend information:

1. Touch the CLEAR LOG/TREND key at the bottom of the screen.

2. The message CLEAR LOG/TREND? appears at the bottom of the screen with YES and NO keys.

3. To erase all information in the data log, NIBP log, and trend, touch the YES key.

   To return to the Data Log screen without clearing any information, touch the NO key.

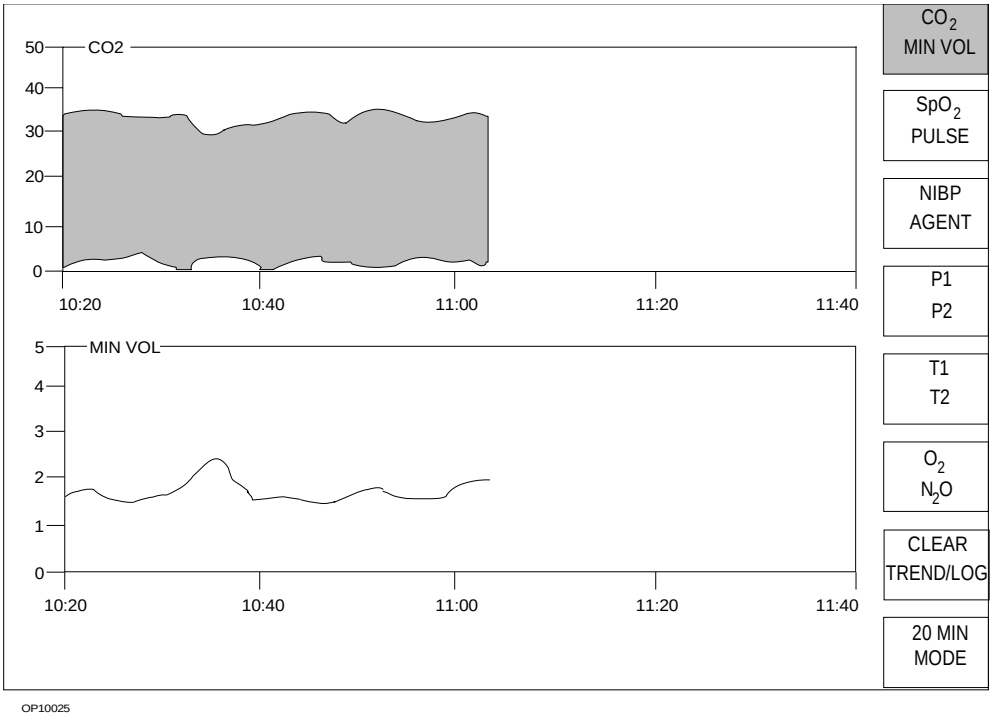
Invoking the Trend Screen

To invoke the Trend screen, press the TREND key on the main key panel.

TREND

The Trend screen displays up to 10 hours and 40 minutes of trend history, showing two trends at a time. You can select from the following six sets of trend pairs. To select a trend display, touch the corresponding key on the right side of the screen.

- carbon dioxide concentration and respiratory minute volume
- oxygen saturation and pulse rate
- noninvasive blood pressure and anesthetic agent concentration
- invasive blood pressure measurements P1 and P2
- temperature measurements T1 and T2
- oxygen and nitrous oxide concentration



Labels for the selected measurements appear at the top of the corresponding trend graph. The horizontal axis is calibrated in units of time. The vertical axes are calibrated in the appropriate units for the selected measurement. Graphs, representing the historical variations of the trend measurements, travel from left to right as new trend data accumulates. The trend graph initially displays up to 1 hour and 20 minutes of trend information. When that time is exceeded, the Narkomed 4 automatically rescales the display by compressing the entire data display into the left half of the screen.

Generally, trend information appears as a single trace plotted against time. The carbon dioxide and agent trends, however, show the inspiratory/expiratory envelope. Similarly, the breathing pressure trend shows the systolic/diastolic envelope, with the mean blood pressure.

Clearing the Trend/Log

You can clear the trends and logs (the data log and the NIBP log) to erase all the previous data in the Narkomed 4's memory. Typically, you clear the trend and logs at the beginning of a procedure before connecting the patient to the monitors. This clears the buffer of old data accumulated during the setup and checkout of the equipment. After the data has been cleared, the current system time is used as the time base, and the display returns to the previous time scale.

To clear the trends and logs (data log and NIBP log):

1. Touch the CLEAR TREND/LOG key at the bottom of the screen.
2. The message CLEAR TREND/LOG? appears at the bottom of the screen with YES and NO keys.
3. To erase all information in the trend, data log, and NIBP log, touch the YES key.

   To return to the Trend screen without clearing any information, touch the NO key.

Using 20-Minute Mode

If you want to see a short trend history, you can use the 20-minute mode. To invoke the 20-minute mode:

1. Touch the 20 MIN MODE key.
2. Approximately the last 20 minutes of trend data appears. When the graph fills the twenty minute time scale, the time scale shifts the data, retaining the most recent 10 minutes of trend data and leaving space for the next 10 minutes of trend data.

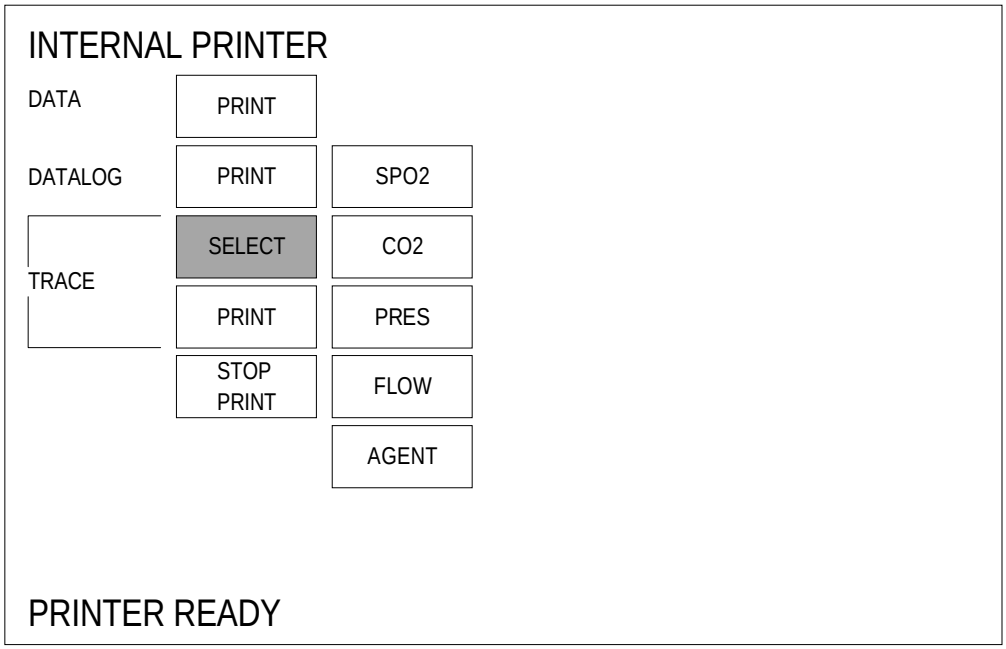
   To leave the 20-minute mode and return to the previous time scale, touch the QUIT 20 MIN key.

Invoking the Print Screen

The Narkomed 4's optional printer can print both numerical information (cardiovascular, temperature, ventilation, etc.) and graphical information (traces and trends).

To invoke the Print screen on the right side of the main display, press the PRINT key on the main key panel.

The print selections (DATA, DATALOG, and TRACE) appear on the left side of the screen.



- To print current data values, such as pulse rate, SpO_2, noninvasive blood pressure, temperature, etc., in tabular form, touch the PRINT key next to the DATA selection.

- To print a hard copy of the data log, touch the PRINT key next to the DATALOG selection.

- To print a hard copy of a specific trace:

  1. Touch the SELECT key next to the TRACE selection.

  2. A second set of keys appears on the screen, showing which traces can be printed (SPO2, CO2, PRES, FLOW, and agent being used - AGENT/HAL/ENF/ISO/SEV/DES.

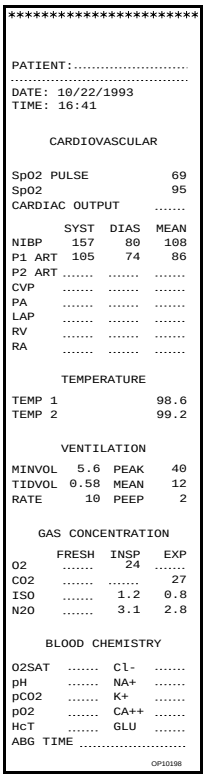
  3. Touch one or more of the trace keys to select them for printing.

  4. To print the trace(s), touch the PRINT key next to the DATA selection.

- To stop the printer during the print process, touch the STOP PRINT key below the TRACE/PRINT keys.

The printer's status is displayed in the lower left portion of the screen. The following printer status messages may appear:

- NO PRINTER - The optional printer is not installed.
- PRINTER READY - The printer is online and ready to print.
- DATA PRINT - Numerical information is being sent to the printer.
- DATALOG PRINT -Data log information is being sent to the printer.
- WAVEFORM PRINT - Waveform information is being sent to the printer.
- PAPER OUT - The printer is out of paper.
- DOOR OPEN - The printer door is not properly latched.
- PRINTER ERROR - There is an internal problem with the printer.



PATIENT:.....
.....
DATE: 10/22/1993
TIME: 16:41

CARDIOVASCULAR

SpO2 PULSE	69
SpO2	95
CARDIAC OUTPUT	.....

	SYST	DIAS	MEAN
NIBP	157	80	108
P1 ART	105	74	86
P2 ART	.....	.....	.....
CVP	.....	.....	.....
PA	.....	.....	.....
LAP	.....	.....	.....
RV	.....	.....	.....
RA	.....	.....	.....

TEMPERATURE

TEMP 1	98.6
TEMP 2	99.2

VENTILATION

MINVOL	5.6	PEAK	40
TIDVOL	0.58	MEAN	12
RATE	10	PEEP	2

GAS CONCENTRATION

	FRESH	INSP	EXP
O2	.....	24	.....
CO2	.....	.....	27
ISO	.....	1.2	0.8
N2O	.....	3.1	2.8

BLOOD CHEMISTRY

O2SAT	.....	Cl-	.....
pH	.....	NA+	.....
pCO2	.....	K+	.....
pO2	.....	CA++	.....
HcT	.....	GLU	.....
ABG TIME	.....		

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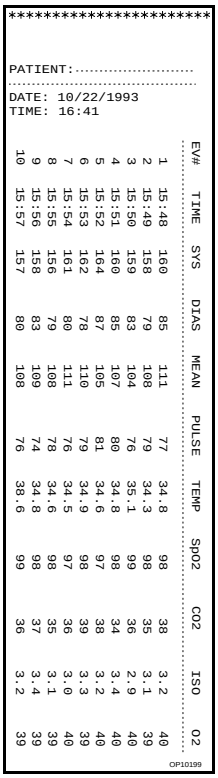
DATA PRINTOUT



PATIENT:.....
.....
DATE: 10/22/1993
TIME: 16:41

EV#	TIME	SYS	DIAS	MEAN	PULSE	TEMP	SpO2	CO2	ISO	O2
1	15:48	160	85	111	77	34.8	98	38	3.2	40
2	15:49	158	79	108	79	34.3	98	35	3.1	39
3	15:50	159	83	104	76	35.1	99	36	2.9	40
4	15:51	160	85	107	80	34.8	98	34	3.4	40
5	15:52	164	87	105	81	34.6	97	38	3.2	40
6	15:53	162	78	110	79	34.9	98	39	3.3	39
7	15:54	161	80	111	76	34.5	97	36	3.0	40
8	15:55	156	79	108	78	34.6	98	35	3.1	39
9	15:56	158	83	109	74	34.8	98	37	3.4	39
10	15:57	157	80	108	76	38.6	99	36	3.2	39

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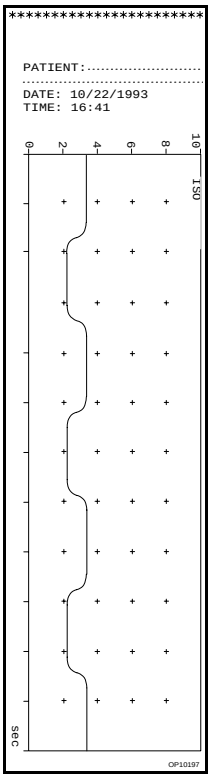
DATALOG PRINTOUT



TRACE PRINTOUT

Configuring the Monitoring System

SYSTEM CONFIG

To access the configuration screens:

- Press the SYSTEM CONFIG key on the main key panel. The first of seven configuration screens appears, with keys on the right for displaying other configuration screens.

To display a particular configuration screen:

- Touch the key on the right side of the screen for the configuration screen you want.

The seven Narkomed 4 configuration screens are listed below, along with the type of information you can view or configure in each of them:

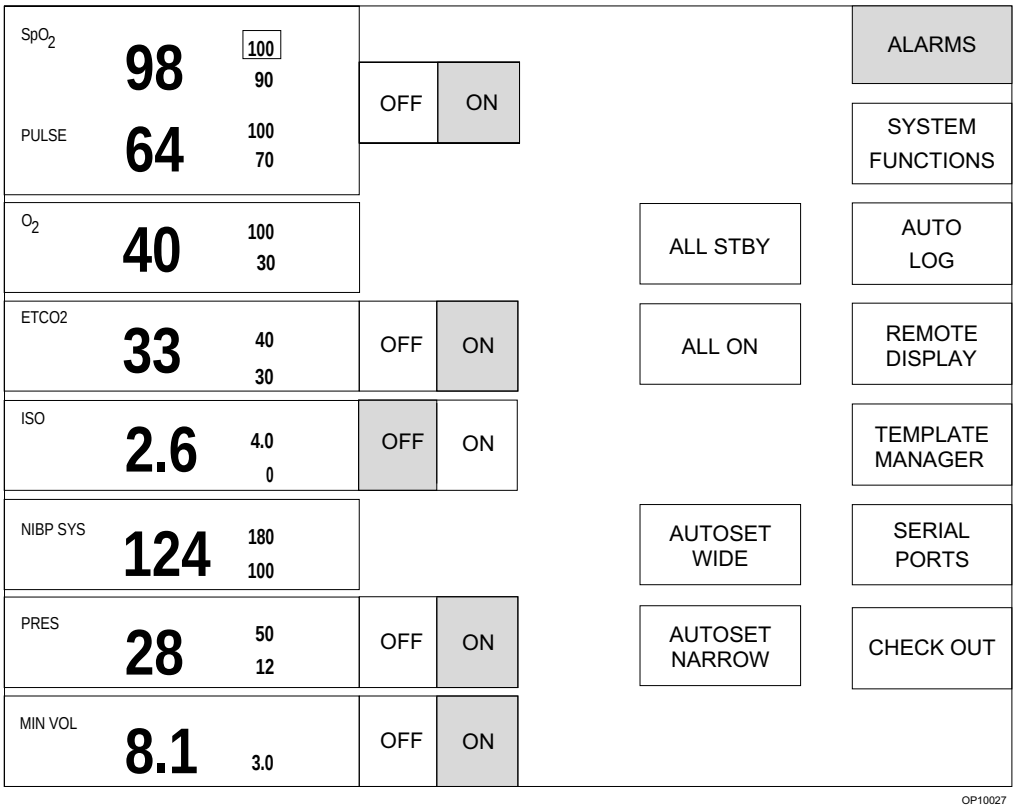
- **Alarms** - alarm limits
- **System Functions** - time, date, audio alarm volume, sweep speed, NIBP annunciator volume, and CO_2 units display
- **Auto Log** - criteria that determine when events are automatically logged
- **Remote Display** - Datascan display, Datascan deviations, alarm autoset deviations, and upper trace window for remote display
- **Template Manager** - invoke, edit, save, and delete templates containing customized system settings
- **Serial Ports** - baud rate, parity, stop bits, data bits, and device type
- **Checkout** - preuse checkout (view only)

Each of these screens is described in detail in the following paragraphs.

Invoking the Alarms Configuration Screen

To invoke the Alarms configuration screen, touch the ALARMS key on the right side of any configuration screen. The Alarms Configuration screen shows all current measurements and the current alarm limits for the following parameters:

- oxygen saturation
- pulse rate
- oxygen concentration
- end-tidal carbon dioxide
- anesthetic agent concentration
- systolic pressure
- peak breathing pressure
- minute volume



Setting Alarm Limits

To set an alarm limit:

1. Use the selection dial to scroll to the desired alarm limit. (A box surrounds the selected limit as you scroll through the settings.)

2. When the alarm limit you want to set is selected (boxed), press the selection dial. This highlights the selected alarm limit value.

3. Turn the selection dial to change the value as desired.

4. Press the selection dial to enter the value.

Setting Alarm On/Off

To enable or disable an individual alarm in the Alarms configuration screen, touch the ON or OFF key to the right of the alarm you want to enable or disable.

Setting All Alarms On/Standby

To set **all** alarms to On or Standby in the Alarms configuration screen, touch the ALL ON key or the ALL STBY key, respectively.

NOTE: Volume and pressure-apnea alarms can be turned to Standby only if the ventilator is off.

Using the Autoset Function

To automatically set all alarm limits around their current patient measurements, you can use the autoset function. Typically, the autoset function should be used after induction, during the maintenance phase of the anesthetic procedure, when the patient measurements have stabilized.

This function works only if there are measurements available; if there are no current measurements, using the autoset function will have no effect. Oxygen concentration and agent concentration alarms are not affected by the autoset function.

To set the alarms to the wide or the narrow range, touch the key for the desired range (AUTOSET WIDE or AUTOSET NARROW).

Selecting the "wide" range sets the alarm limits to the following values:

Alarm	Value
SpO_2	Current measurement ± 5%
Pulse	Current measurement ± 20/min
$EtCO_2$	Current measurement ± 10 mmHg, ± 1.3 kPa, or ± 1.3%
NIBP Systolic	Current measurement ± 50 mmHg

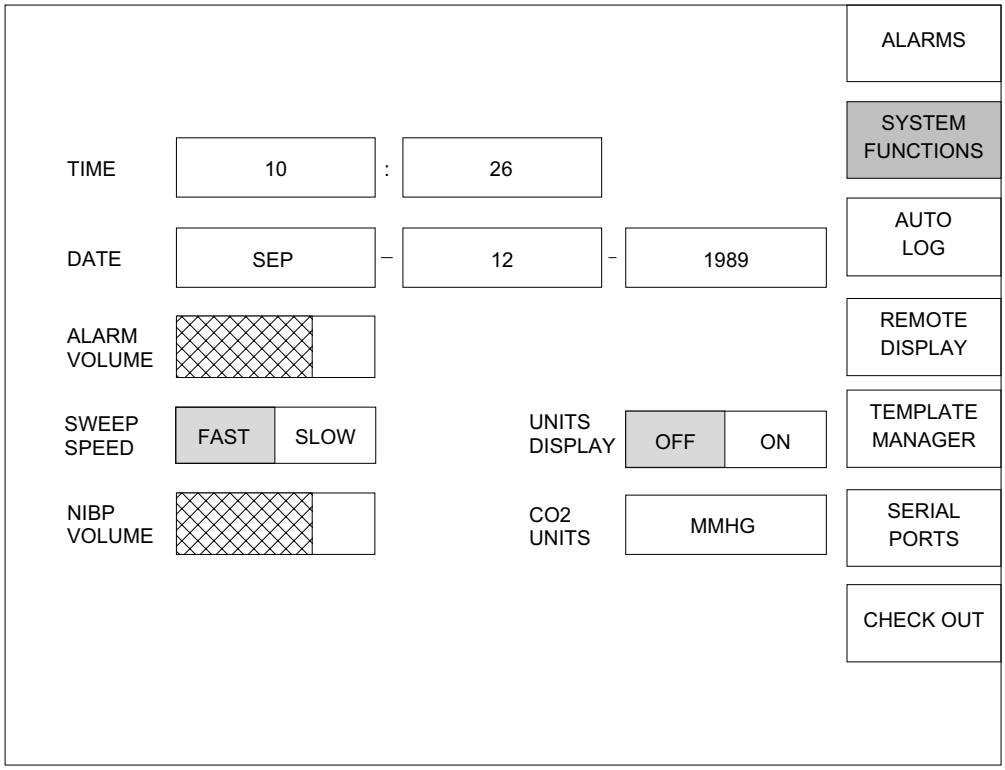
Selecting the "narrow" range sets the alarm limits to the following values:

Alarm	Value
SpO_2	Current measurement ± 3%
Pulse	Current measurement ± 10/min
$EtCO_2$	Current measurement ± 5 mmHg, ± 0.7 kPa, or ± 0.7%
NIBP Systolic	Current measurement ± 25 mmHg

Invoking the System Functions Configuration Screen

To invoke the System Functions configuration screen, touch the SYSTEM FUNCTIONS key on the right side of any configuration screen. This screen allows you to set the following:

- time and date
- audio alarm volume
- sweep speed
- NIBP annunciator volume
- CO_2 units display



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Setting Time and Date

To set the time or date:

1. Touch the key for the item you want to change.
2. Turn the selection dial to change the value as desired.

Setting Audio Alarm Volume

To adjust the volume of the audio alarm:

1. Touch the ALARM VOLUME key. A sample tone is generated to assist in setting the volume level.
2. Turn the selection dial to the desired volume.
3. Press the selection dial, or select another function or screen, to set the volume level.

Setting the Sweep Speed

The sweep speed selects the sweep rate of the monitor traces. To adjust the sweep speed, touch the FAST or SLOW key.

Setting NIBP Volume

To adjust the NIBP volume:

1. Touch the NIBP VOLUME key. A sample tone is generated to assist in setting the volume level.
2. Turn the selection dial to the desired volume.
3. Press the selection dial, or select another function or screen, to set the volume level.

Setting CO_2 Units Display On/Off

This setting enables and disables the display of CO_2 units on the CO_2 monitor display. To set it, touch the ON or OFF key.

NOTE: Data will continue to be displayed in the most recently selected units even after the units display is set to OFF.

Setting the CO_2 Units

To set the CO_2 units:

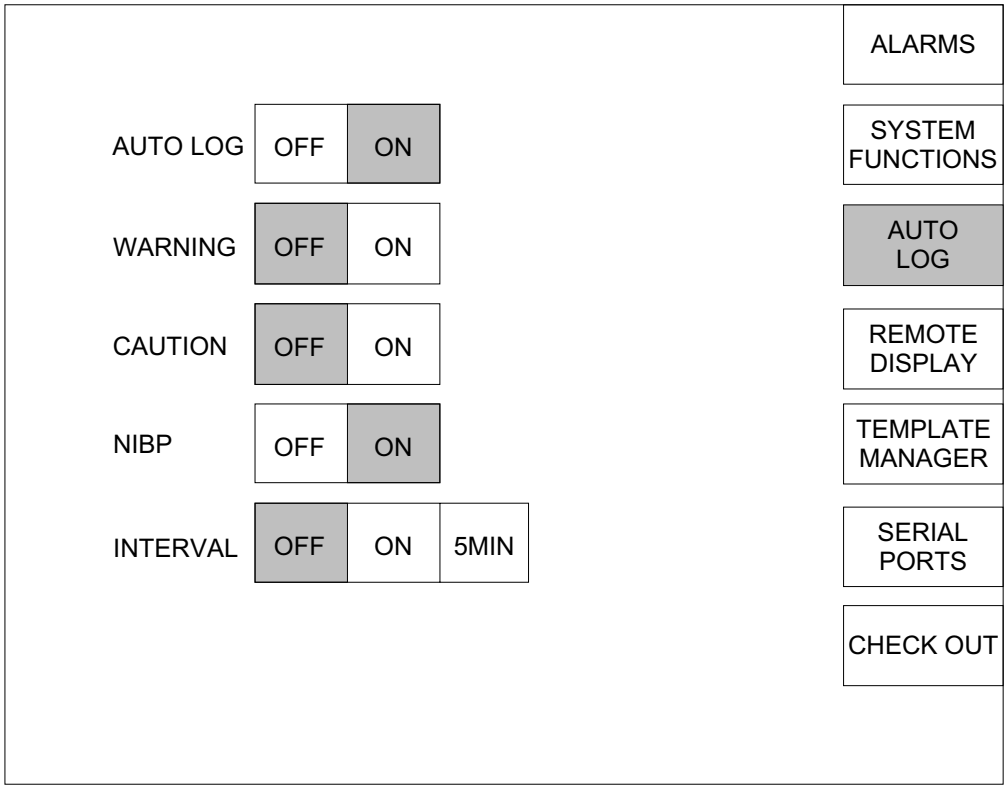
1. Touch the CO_2 units setting.
2. Turn the selection dial to display the desired setting (MMHG, %, KPA).
3. Press the selection dial, or select another function or screen.

Invoking the Auto Log Configuration Screen

To invoke the Auto Log configuration screen, touch the AUTO LOG key on the right side of any configuration screen.

The Auto Log Configuration screen allows you to turn the Auto Log function on and off and to set the criteria that determine when an event is automatically entered in the data log. You can configure the settings to log an event when one or more of the following occur:

- a warning alarm
- a caution alarm
- an NIBP measurement
- a preselected time interval passes (1, 2, 5 or 10 minutes)



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Setting Auto Log/ Warning/Caution/ NIBP On/Off

To set the Auto Log, Warning, Caution, or NIBP functions to ON or OFF,touch the ON or OFF key for each function as desired.

The AUTO LOG function must be set to ON in order for information to be saved automatically in accordance with the options you select.

Setting the Time Interval

To adjust the time interval function:

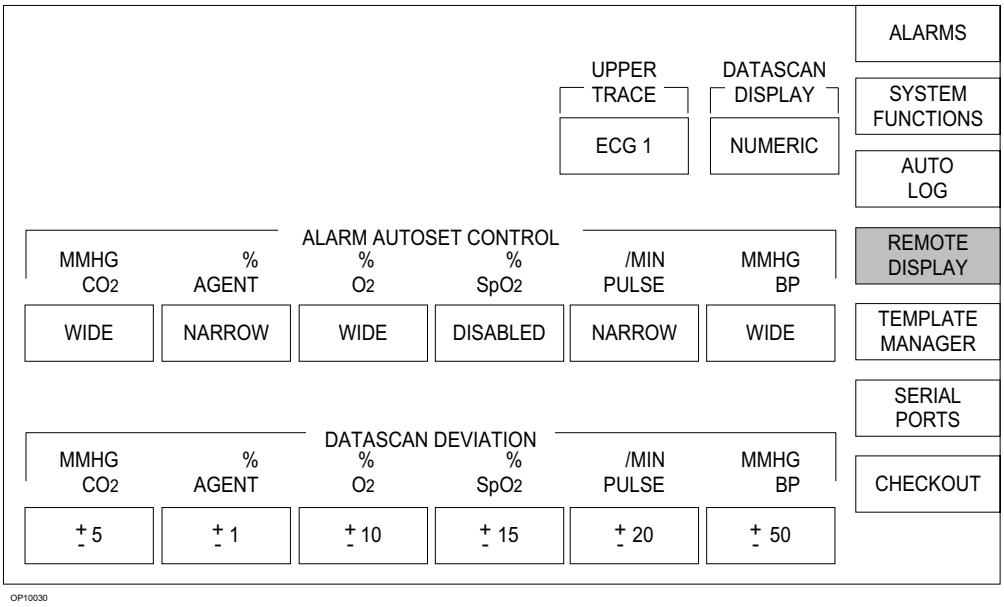
1. Touch the interval setting.
2. Turn the selection dial to change the value.
3. Press the selection dial to enter the new value.

Invoking the Remote Display Configuration Screen

To invoke the Remote Display configuration screen, touch the REMOTE DISPLAY key on the right side of any configuration screen.

The Remote Display Configuration screen allows you to perform the following functions:

- select the upper trace monitor display
- select the Datascan display
- specify alarm autoset deviation values for the numeric Datascan
- specify deviation values for the bar graph Datascan



Selecting the Upper Trace Display

This setting allows you to select the monitor to be displayed in the upper trace window of the remote display.

1. Touch the UPPER TRACE setting.
2. Turn the selection dial to display the available settings (CO2, EXP. FLOW, PRESSURE, SPO2, AGT, ECG 1, ECG 2, ECG 3).

NOTE: The Narkomed 4 can display ECG 1 waveform data from the Vitalert 2000, and ECG 1, ECG 2, and ECG 3 waveform data from the Hewlett-Packard Merlin.

3. Press the selection dial to make the selection.

Selecting the Datascan Display

To select the Datascan display for the remote display:

1. Touch the DATASCAN DISPLAY setting.

2. Turn the selection dial to display the available settings (BAR GRAPH or NUMERIC).

3. Press the selection dial to make the selection.

Setting Alarm Autoset Deviations

Below each measurement is a key that shows the current Alarm Autoset deviation value (WIDE, NARROW, or DISABLED). The WIDE and NARROW settings are similar to the AUTOSET WIDE and AUTOSET NARROW functions in the Alarms configuration screen, in that they are used to set alarm limits around the current measurement values. However, you can set the deviation value for each measurement independently for both patient and machine measurements.

The alarm limits will be reset to the deviation values specified in this screen when you press the AUTOSET key.

NOTE: The AUTOSET key will not reset alarm limits on externally connected, third-party monitors.

To set the deviation value:

1. Touch the key for the desired measurement.

2. Turn the selection dial to change the setting. If the DISABLED option is selected, alarm limits for the corresponding measurement will not be changed when the AUTOSET key is pressed. The WIDE and NARROW settings correspond to the deviation values shown in the following table.

Alarm	WIDE Setting	NARROW Setting
CO_2	Current measurement ± 10 mmHg, ± 1.3 kPa, or ± 1.3 %	Current measurement ± 5 mmHg, ± 0.7 kPa, or ± 0.7 %
Agent	Current measurement ± 2 %	Current measurement ± 1 %
O_2	Current measurement ± 20 %	Current measurement ± 10 %
SpO_2	Current measurement ± 5%	Current measurement ± 3%
Pulse	Current measurement ± 20/min	Current measurement ± 10/min
BP	Current measurement ± 50 mmHg	Current measurement ± 25 mmHg

3. Press the selection dial to enter the value.

Setting Bar Graph Datascan Deviations

This setting determines the deviation values that will be used to reset the center line and endpoints on the Datascan bar graphs. The bar graphs will be reset according to these deviation values when you press the AUTOSET key on the control key panel.

To set the bar graph Datascan deviations:

1. Touch the key for the desired measurement.

2. Turn the selection dial to change the setting. The available scaling values for each measurement are given in the table below.

Measurement	Scaling Values
CO_2	Current Measurement ± 5, 10, 15, or 20 mmHg
Agent	Current Measurement ± 1, 2, 3, or 4 %
O_2	Current Measurement ± 10, 20, 30, or 40 %
SpO_2	Current Measurement ± 2, 5, 10, or 15 %
Pulse	Current Measurement ± 10, 20, 50, or 75 BPM
BP	Current Measurement ± 10, 20, 50, or 75 mmHg

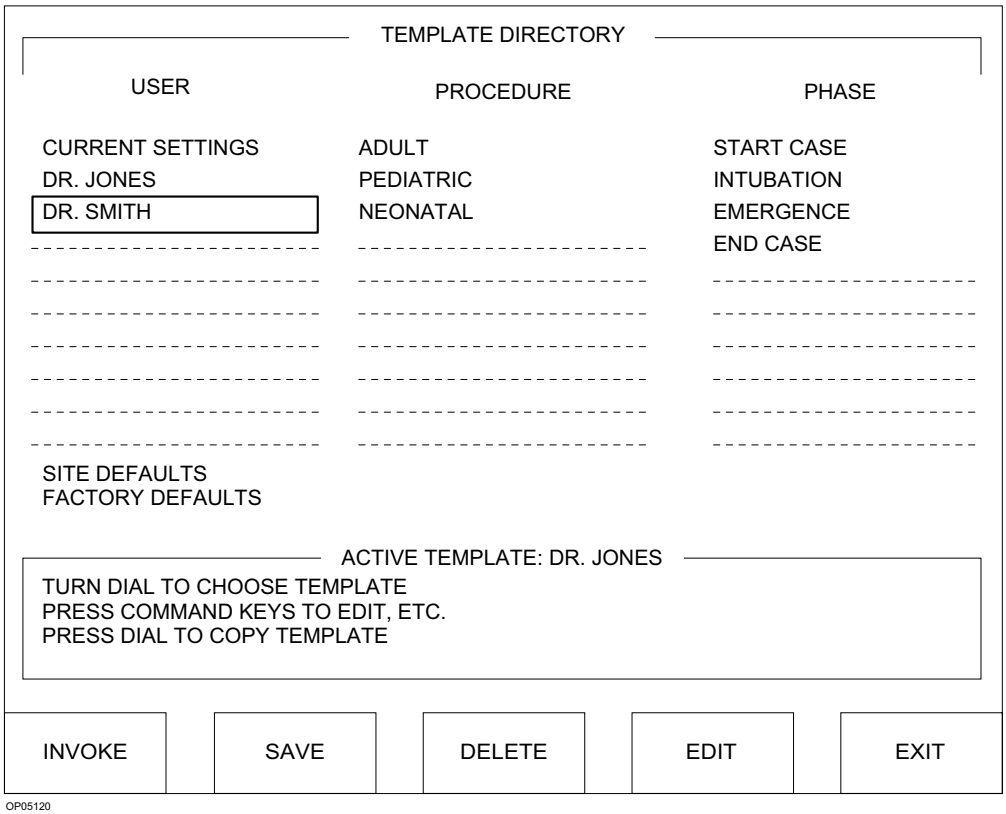
3. Press the selection dial to make the selection.

Invoking the Template Manager Configuration Screen

To invoke the Template Manager configuration screen, touch the TEMPLATE MANAGER key on the right side of any configuration screen. This screen allows you to choose preconfigured system settings from a list of previously configured templates. You can also change settings, save new settings in templates, and delete old ones.

The Template Manager screen is shown on the right side of the main display. The top part of the screen contains the template directory which lists all existing templates, organized into three categories: USER, PROCEDURE, and PHASE. Each category can have up to ten entries. The USER category includes the CURRENT SETTINGS template which contains the active system settings with modifications made during use.

Below the USER entries are the SITE DEFAULTS and FACTORY DEFAULTS templates. The FACTORY DEFAULTS template contains factory default values and cannot be modified. Values stored in the SITE DEFAULTS template are used as the power-on defaults; you can change the site default values, but you cannot change the template name (SITE DEFAULTS).



The bottom portion of the screen contains a dialog box and various touch keys. The dialog box identifies the currently active template and provides help information and user prompts. The touch keys are used to perform template operations: INVOKE, SAVE, DELETE, EDIT, and EXIT. Not all keys are available for each type of template, however, and keys will be removed from the screen for those operations that are not available.

In addition to the functions provided by the touch keys, a template Copy function can be initiated by pressing the selection dial.

The following sections provide complete information on template operations.

Template Editor

The Template Editor allows you to view and edit template settings without invoking the changes. Four editor screens are available:

- Alarms Editor
- Monitor Editor
- Auto Log Editor
- Display Editor

Alarms Editor Screen

The following illustration shows the Alarms Editor screen. For information on setting individual alarms, see the Operation section for each monitoring function later in this manual. For information on setting alarm volume, see “Invoking the System Functions Configuration Screen” earlier in this section.

The AUTOSET setting at the bottom of the Alarms Editor screen can be set to WIDE, NARROW, or DISABLED. The DISABLED setting allows you to set each alarm limit individually. The WIDE and NARROW settings are used to set alarm limits around their current measurements; for complete information on the WIDE and NARROW ranges, see “Invoking the Alarms Configuration Screen” earlier in this section.

The Alarms Editor screen also allows you to set alarm limits for multiple agents. The alarm limits for the specific agent will be automatically invoked when that vaporizer is activated.

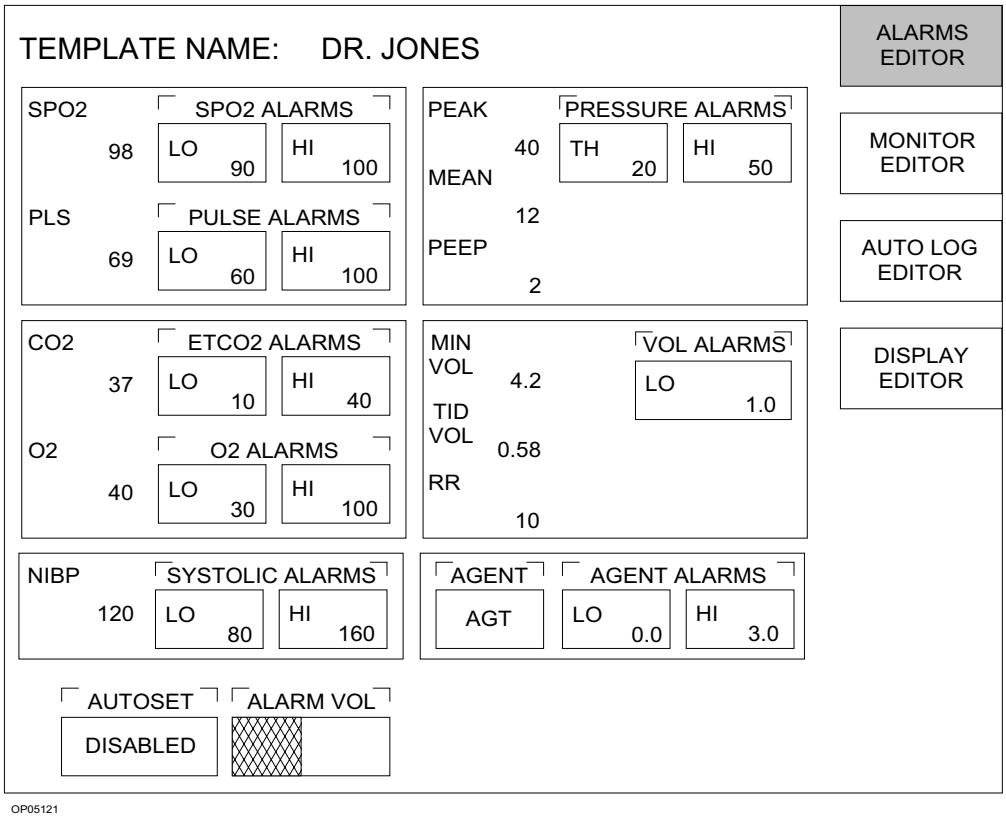
To adjust alarm limits for multiple agents:

1. Touch the AGENT key.

2. Rotate the selection dial to display the agent you want.

3. Touch the key for the alarm limit you want to adjust (LO or HI), and rotate the selection dial to adjust the value.

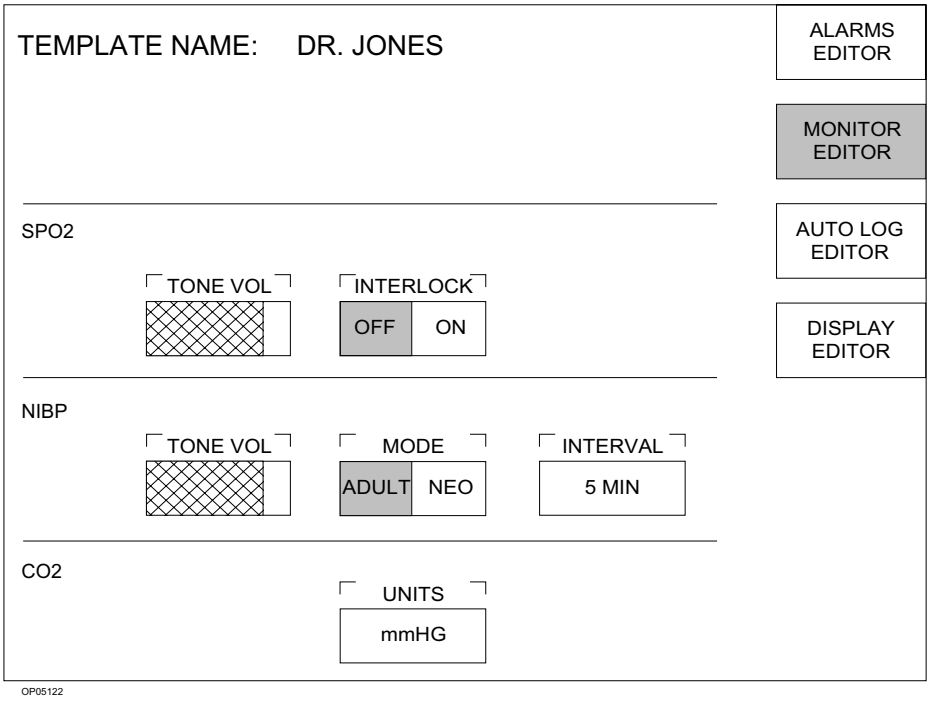
4. Repeat this procedure for each agent you want to adjust.



Monitor Editor Screen

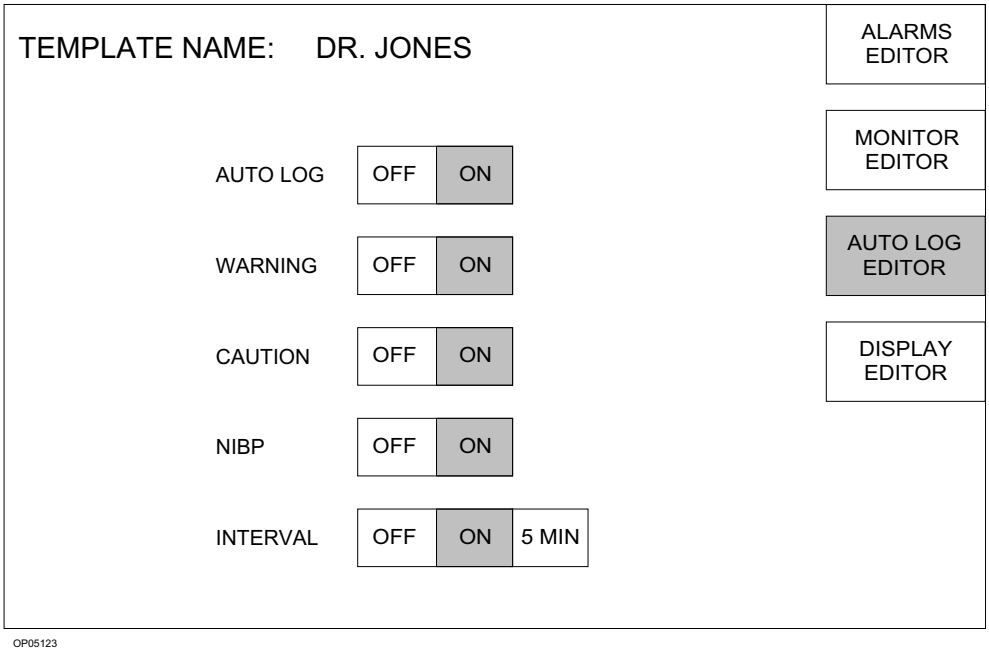
The following illustration shows the Monitor Editor Screen.

- for information on setting SpO_2 Tone Volume and Interlock, see Section 5, “Operation, Pulse Oximetry Monitoring.”
- for information on setting NIBP Tone Volume and CO_2 Units Display, see “Invoking the System Functions Configuration Screen” earlier in this section.
- for information on setting NIBP Mode and Interval, see Section 5, “Operation, NIBP Monitoring.”



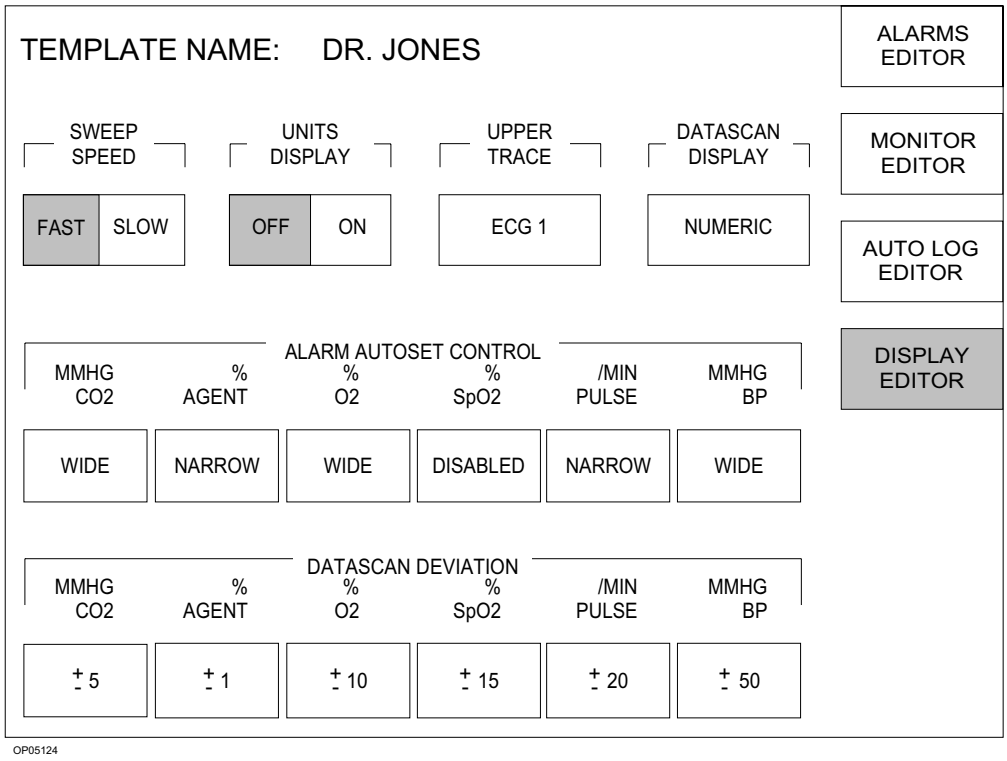
Auto Log Editor Screen

The following illustration shows the Auto Log Editor Screen. For information on Auto Log settings, see “Invoking the Auto Log Configuration Screen” earlier in this section.



Display Editor Screen

The following illustration shows the Display Editor Screen. For information on setting Trace Speed and Unit Labels, see "Invoking the Systems Functions Configuration Screen" earlier in this section. For information on display settings for the remote display, see "Invoking the Remote Display Configuration Screen" earlier in this section.



Viewing/ Editing Existing Templates

To view a template:

1. Touch the EDIT key at the bottom of the Template Manager screen. The first of four editor screens appears on the left side of the main display, with keys on the right side of the screen for selecting the other editor screens.

   NOTE: Touching the EDIT key a second time closes the editor screen and restores the Monitor screen display.

2. Touch the key for the editor screen you want (ALARMS EDITOR (default), MONITOR EDITOR, AUTO LOG EDITOR, or DISPLAY EDITOR).

3. Rotate the selection dial to position the cursor on the template you want to see. As you scroll through the template directory, the Template Editor screen will be updated to show the settings in that template. When the cursor is positioned on a blank entry line, the settings will reflect the CURRENT SETTINGS template.

To edit the template:

4. When the desired template is displayed, touch the key for the adjustment you want to make. The selection dial control is now switched to the Template Editor screen.

5. When you are finished making changes, press the selection dial to confirm the changes, or touch one of the keys at the bottom of the Template Manager screen. Selection dial control is now returned to the Template Manager screen.

To save the edited template:

6. Once all changes are made, touch the SAVE key. The following prompt is displayed:

   OVERWRITE TEMPLATE NAME: xxxxx
   ARE YOU SURE? YES NO

7. To overwrite the template, touch the YES key.

   - If you do not want to overwrite the template, touch the NO key. You may then make further changes in the Template Editor screen, or you may go on to perform other operations from the Template Manager screen.

8. If you respond with a YES to the overwrite prompt, the following prompt to change the template name appears:

   CHANGE TEMPLATE NAME: xxxxx
   ARE YOU SURE? YES NO

9. To rename the template, touch the YES key.

   - If you want to keep the current name, touch the NO key. The modified template is saved under the same name and the selection dial control is returned to the Template Manager screen.

10. If you respond with a YES to the change name prompt, the selection dial is enabled for entering a new template name. A highlighted letter "A" appears in the first character position of the template name, and the following directions and prompt appear in the dialog box:

    USE DIAL TO ENTER NAME
    PRESS SAVE KEY TO CANCEL
    ARE YOU DONE? YES

11. Use the selection dial to scroll the highlighted character through the available options (letters A-Z, numbers 0-9, the characters <, >, and *, and a blank space). When the appropriate character appears, press the selection dial. The cursor moves to the next position.

    NOTE: The * character is used to clear all characters to the right of it. The < character is used to move the cursor backward, and the > character is used to move the cursor forward.

12. Continue to enter characters to complete the name. When you are finished entering the template name, touch the YES key in the dialog box. The name can contain up to 16 characters.

Invoking a Template

To invoke a template:

1. Touch the INVOKE key. If you have moved the selection dial before touching the INVOKE key, then the selected template will be invoked immediately after you touch the INVOKE key, and the template name will be displayed in the dialog box as the ACTIVE TEMPLATE.

2. If you have *not* moved the selection dial before touching the INVOKE key, then the INVOKE key is highlighted, and the SAVE and DELETE keys are removed from the screen.

    NOTE: Touching the INVOKE key a second time cancels the operation; touching the EXIT key cancels the operation and exits the Template Manager without invoking the template.

3. Rotate the selection dial to position the cursor on the template you want to invoke, and press the selection dial.

4. The selected template is invoked, and the selected template name is displayed in the dialog box as the ACTIVE TEMPLATE.

Creating a New Template

To create a new template:

1. Rotate the selection dial to position the cursor on a blank entry line in the template directory.

   The settings for a "blank" template reflect the settings in the CURRENT SETTINGS template. You may either save those settings without any changes under a new name or you may make changes and then save them under a new name. For editing instructions, see “Viewing/Editing Templates” earlier in this section.

2. Touch the SAVE key.

   NOTE: Touching the SAVE key a second time cancels the operation; touching the EXIT key cancels the operation and exits the Template Manager without saving the template.

3. The selection dial is enabled for entering a new template name. A highlighted letter "A" appears in the first character position of the template name, and the following directions and prompt appear in the dialog box:

   USE DIAL TO ENTER NAME
   PRESS SAVE KEY TO CANCEL
   ARE YOU DONE? YES

4. Use the selection dial to scroll the highlighted character through the available options (letters A-Z, numbers 0-9, the characters <, >, and *, and a blank space). When the appropriate character appears, press the selection dial. The cursor moves to the next position.

   NOTE: The * character is used to clear all characters to the right of it. The < character is used to move the cursor backward, and the > character is used to move the cursor forward.

5. Continue to enter characters to complete the name. When you are finished entering the template name, touch the YES key in the dialog box. The name can contain up to 16 characters.

Changing a Template Name

To change the name of an existing template:

1. Rotate the selection dial to position the cursor on the template name you want to change.

2. Touch the SAVE key. The following prompt is displayed:

   CHANGE TEMPLATE NAME: xxxxx
   ARE YOU SURE? YES NO

   NOTE: Touching the SAVE key a second time cancels the operation; touching the EXIT key cancels the operation and exits the Template Manager without saving the template.

3. To rename the template, touch the YES key.

   - If you do not want to change the name, touch the NO key. The SAVE key will no longer be highlighted and the selection dial will be enabled for scrolling through the Template Directory.

4. If you respond with a YES to the change name prompt, the selection dial is enabled for entering a new template name. A highlighted letter "A" appears in the first character position of the template name, and the following directions and prompt appear in the dialog box:

   USE DIAL TO ENTER NAME
   PRESS SAVE KEY TO CANCEL
   ARE YOU DONE? YES

5. Use the selection dial to scroll the highlighted character through the available options (letters A-Z, numbers 0-9, the characters <, >, and *, and a blank space). When the appropriate character appears, press the selection dial. The cursor moves to the next position.

   NOTE: The * character is used to clear all characters to the right of it. The < character is used to move the cursor backward, and the > character is used to move the cursor forward.

6. Continue to enter characters to complete the name. When you are finished entering the template name, touch the YES key in the dialog box. The name can contain up to 16 characters.

Copying an Existing Template to a New Template

To copy the settings in an existing template to a new template:

1. Rotate the selection dial to position the cursor on the template you want to copy.

2. Press the selection dial. The template name is highlighted and the following prompt is displayed:

   COPY TEMPLATE TO: xxxxx
   PRESS SAVE KEY TO SAVE TEMPLATE
   PRESS DIAL TO CANCEL COPY

3. Rotate the dial to position the cursor on a blank entry line in the template directory.

4. Touch the SAVE key.

   NOTE: Touching the SAVE key a second time cancels the operation; touching the EXIT key cancels the operation and exits the Template Manager without saving the template.

5. The selection dial is enabled for entering a new template name. A highlighted letter "A" appears in the first character position of the template name, and the following directions and prompt appear in the dialog box:

   USE DIAL TO ENTER NAME
   PRESS SAVE KEY TO CANCEL
   ARE YOU DONE? YES

6. Use the selection dial to scroll the highlighted character through the available options (letters A-Z, numbers 0-9, the characters <, >, and *, and a blank space). When the appropriate character appears, press the selection dial. The cursor moves to the next position.

   NOTE: The * character is used to clear all characters to the right of it. The < character is used to move the cursor backward, and the > character is used to move the cursor forward.

7. Continue to enter characters to complete the name. When you are finished entering the template name, touch the YES key in the dialog box. The name can contain up to 16 characters.

Copying an Existing Template to Another Existing Template

To copy the settings in an existing template to another existing template:

1. Rotate the selection dial to position the cursor on the template you want to copy.

2. Press the selection dial. The template name is highlighted and the following prompt is displayed:

   COPY TEMPLATE TO: xxxxx
   PRESS SAVE KEY TO SAVE TEMPLATE
   PRESS DIAL TO CANCEL COPY

3. Rotate the dial to position the cursor on the existing template you want to copy to.

4. Touch the SAVE key.

   OVERWRITE TEMPLATE: xxxxx
   ARE YOU SURE? YES NO

5. To overwrite the template you are copying to, touch the YES key.

   - If you do not want to overwrite the template, touch the NO key. The SAVE key will no longer be highlighted and the selection dial will be enabled for scrolling through the Template Directory.

6. If you respond with a YES to the overwrite prompt, the following prompt to change the template name appears:

   CHANGE TEMPLATE NAME: xxxxx
   ARE YOU SURE? YES NO

7. To rename the template you are copying to, touch the YES key.

   - If you want to keep the current name, touch the NO key. The existing template name is retained and the selection dial control is returned to the template manager screen.

8. If you respond with a YES to the change name prompt, the selection dial is enabled for entering a new template name. A highlighted letter "A" appears in the first character position of the template name, and the following directions and prompt appear in the dialog box:

USE DIAL TO ENTER NAME
PRESS SAVE KEY TO CANCEL
ARE YOU DONE? YES

9. Use the selection dial to scroll the highlighted character through the available options (letters A-Z, numbers 0-9, the characters <, >, and *, and a blank space). When the appropriate character appears, press the selection dial. The cursor moves to the next position.

   NOTE: The * character is used to clear all characters to the right of it. The < character is used to move the cursor backward, and the > character is used to move the cursor forward.

10. Continue to enter characters to complete the name. When you are finished entering the template name, touch the YES key in the dialog box. The name can contain up to 16 characters.

Deleting a Template

To delete a template:

1. Touch the DELETE key. If you have *not* moved the selection dial before touching the DELETE key, then the DELETE key is highlighted, and the INVOKE and SAVE keys are removed from the screen.

   - If you *have* moved the selection dial before touching the DELETE key, the delete prompt is displayed immediately (skip to step 3 below).

   NOTE: Touching the DELETE key a second time cancels the operation; touching the EXIT key cancels the operation and exits the Template Manager without deleting the template.

2. Rotate the selection dial to position the cursor on the template you want to delete, and press the selection dial.

3. The following prompt to delete the template appears:

   DELETE TEMPLATE: xxxxx
   ARE YOU SURE? YES NO

4. To delete the template, touch the YES key.

   - If you do not want to delete the template, touch the NO key; the delete process is canceled.

5. If you respond with a YES to the delete prompt, the selected template name is cleared and replaced with dashes in the Template Directory.

Exiting the Template Manager

To exit the template manager, touch the EXIT key; you will be returned to the Alarms configuration screen.

- If changes to a template had been made but not saved when the EXIT key is touched, the following prompt will appear in the dialog box before the screen is exited. Respond accordingly.

  TEMPLATE NOT SAVED: xxxxx
  SAVE TEMPLATE? YES NO

Invoking the Serial Ports Configuration Screen

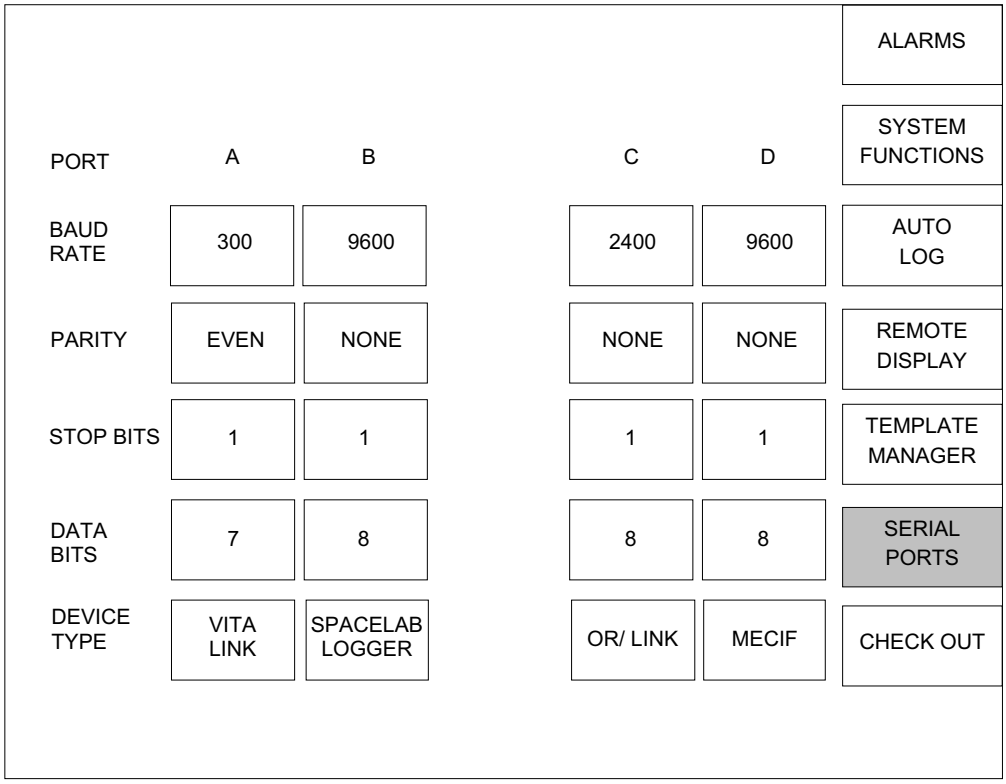
To invoke the Serial Ports configuration screen, touch the SERIAL PORTS key on the right side of any configuration screen. This screen is used to configure the serial ports on the back of the Narkomed 4 (ports A, B, C, and D).

To adjust a port's configuration:

1. Touch the key for the port and variable setting you want to configure (for example, PORT C BAUD RATE).

2. Rotate the selection dial to select the desired setting.

3. Press the selection dial to make the selection.



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NOTE: The device connected to the configured port must have the same configuration. For example, if Port A is configured as 9600 baud, odd parity, 1 stop bit, 8 data bits, and Vitalink, the remote device connected to Port A must be configured the same to ensure communication.

NOTE: Data that is sent to the Narkomed 4 that is outside its display range will not appear on the monitoring screens.

NOTE: The CO_2 units on the Narkomed 4 must be the same as the units on the external device. If the CO_2 units on the external device are changed, the CO_2 numeric display on the Narkomed 4 will be blanked.

The following table shows the suggested settings for devices connected to the Narkomed 4.

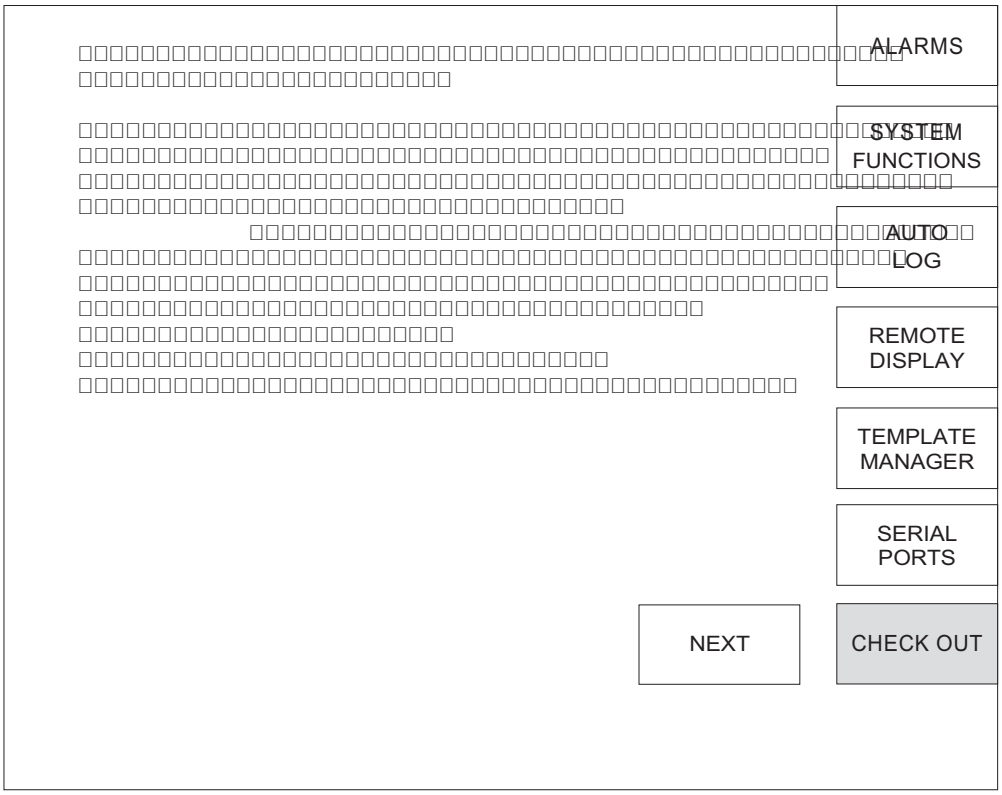
	Baud Rate	Parity	Stop Bits	Data Bits	Protocol
Vitalink and OR/Link Devices	1200, 9600, 19.2K, or 38.4K	ODD, EVEN, or NONE	1 or 2	7 or 8	VITALINK or OR/LINK
Hewlett-Packard MECIF Devices	19.2K or 38.4K	NONE	1	8	HP MECIF
	NOTE: The remote MECIF device must be set to transmit HIGH BYTE/LOW BYTE.				
	NOTE: Communications must be set to at least 19.2K baud in order for the Narkomed 4 to display ECG waveform information from the MECIF device.				
SpaceLabs DataLogger Devices	9600	NONE	1	8	SPACELAB LOGGER
Marquette TramNet Devices	9600	NONE	1	8	TRAM NET
	NOTE: Only ports A and B support TramNet communications.				
Datex AS/3 Devices	19.2K	EVEN	1	8	DATEX AS3
Datex CARDIOCAP and CAPNOMAC Devices	1200	NONE	1	8	DATEX CARDCAP
Criticare Poet IQ Devices	19.2K	NONE	1	8	CRITICAR POET IQ
Criticare 1100 Devices	9600	NONE	1	8	CRITICAR 1100
Datascope Multinex Devices	2400	NONE	1	8	DATASCOP MULTINEX

Datascope Passport and Point-of-View Devices	9600	NONE	1	8	DATASCOP DIAP
Siemens SIRECUST Devices	4800	EVEN	1	8	SIEMENS SIRECUST
Puritan-Bennett Devices	1200	NONE	1	8	PURITAN BENNETT
Colin BP-508 Devices	4800	EVEN	1	7	COLIN BP-508
Criticon DINAMAP Devices	600	NONE	1	8	CRITICON DINAMAP
Nellcor N-1000/N-2500 Devices	9600	NONE	1	8	NELLCOR N-1000
Ohmeda Rascal Devices	9600	NONE	1	8	RASCAL
Ohmeda RGM Devices	9600	NONE	1	8	OHMEDA RGM

Invoking the Checkout Screen

To invoke the Checkout configuration screen, touch the CHECK OUT key on the right side of any configuration screen. The Checkout screen displays the preuse checklist. This is the same list available from the Power-On screen (after system diagnostics are completed).

To page through the checklist, touch the NEXT key.



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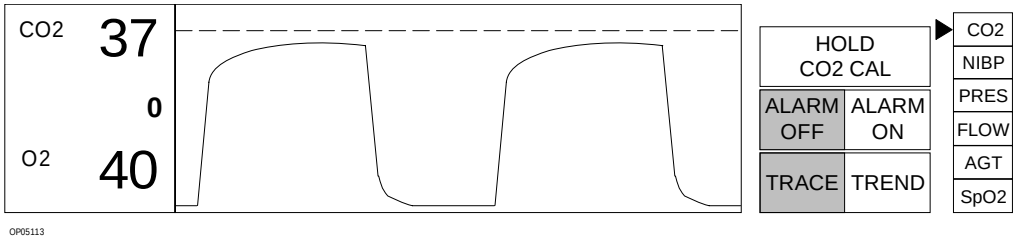
Section 5 - Operation
Monitoring System

Datagrip Operation

Following power-up, the CO_2 monitoring screen appears on the lower section of the remote display. A cursor appears next to the CO2 label at the right of the screen. The Datagrip is used to select the monitoring screens and associated monitoring options.



Selecting a Monitoring Screen

The monitoring screens available for viewing on the lower portion of the remote display are shown in the monitor selection list at the right of the screen. The monitor selection list contains a label for each monitoring screen (CO2, NIBP, PRES, FLOW, AGT, SPO2). The currently selected monitor is the highlighted one; if no labels are highlighted, it means that no monitor is currently selected.

NOTE: If the optional O.R. Data Manager is installed on the system, the label ORDM will appear in the monitor selection list. For complete information, see Section 5, “Operation, O.R. Data Manager”.

To select a monitoring screen:

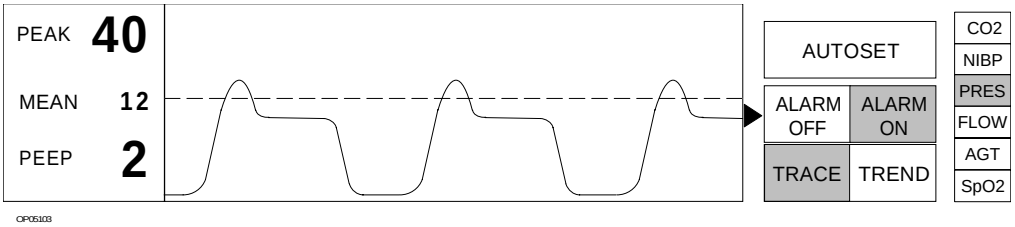
1. Rotate the thumbwheel to position the cursor at the monitor selection list on the right side of the screen.

2. If a monitor is currently selected (highlighted), press the trigger to "deselect" it. This will enable the cursor to move freely through the monitor selection list.

3. Rotate the thumbwheel, up or down, to move the cursor to the desired monitor label.

NOTE: As you scroll through the selections, each monitoring screen and associated Datagrip options will appear on the remote display after a brief pause.

4. Press the trigger to select the monitor. The selected monitor name will become highlighted, and the cursor will advance to the monitor Datagrip options. For example, in the following illustration the breathing pressure monitor has been selected.



Selecting an Option

Once a monitor is selected, you can choose one of the options as follows:

1. Rotate the thumbwheel to move the cursor between the available Datagrip options.

2. Press the trigger to select an option. The option will become highlighted.

The Datagrip options are specific to each monitor. They are used to perform some of the same functions as the corresponding monitor touch keys on the main display. See the *Operation* section for the individual monitors for complete information on functionality.

NOTE: Selecting ALARM OFF or ALARM ON from either the remote display or the main display determines the alarm setting for both displays, whereas the TRACE/TREND displays can be selected independently, allowing a trace display on one screen and a simultaneous trend display on the other.

When the NIBP monitoring screen is selected, a second cursor in the form of a box appears around the START option. (The highlighted option represents the current status.) Turning the thumbwheel sequences the box cursor through the START, STOP, and STAT options. When the box cursor is around the desired option, press the trigger to select and highlight the option.

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Overview

The Narkomed 4's pulse oximetry monitoring allows noninvasive monitoring of both arterial oxygen saturation (SpO_2) and pulse rate via a spectrophotometric transmission sensor applied to the patient's finger (optional sensors may be applied at different sites). The sensor incorporates two low-power LED light sources and a photodetector.

Two wavelengths of transmitted light illuminate the tissue under the probe. They are absorbed differently by the oxyhemoglobin and deoxyhemoglobin. These light transmissions are read by the photoreceptor and converted to electrical pulses that represent absorbance. From these electrical pulses, the monitor processes both the pulse rate and the percentage of available hemoglobin that is saturated with oxygen.

NOTE: The arterial hemoglobin oxygen saturation is calculated as a percentage of total functional hemoglobin (that is, hemoglobin available to transport oxygen). Significant levels of dysfunctional hemoglobin (for example, carboxyhemoglobin, methemoglobin) may cause an inaccurate measurement.

Connecting the Pulse Oximeter Sensor

When preparing for a case that includes pulse oximetry monitoring, be sure to choose a sensor that is proper for the application and location and to apply the sensor correctly.

Sensor Types

A reusable finger sensor is provided with the Narkomed 4. The sensor is supplied in an individual nonsterile package. Other sensors, which have limited reuse capability and can be applied to different sites, are also available (see Appendix A, "Spare and Replacement Parts"). For more information on other sensors, consult the detailed instructions provided with each sensor.

The supplied finger sensor is recommended for relatively immobile patients who weigh more than 40 kg. This sensor is not recommended for active patients or for prolonged cases (for example, nonanesthesia applications, such as monitoring of long-term respiratory support).

Sensor Site

The preferred site for the sensor is the index finger. If you cannot use the index finger, use another digit; however, avoid large or very small digits. (If the patient is large or obese, use a small finger.)

NOTE: Do not place the sensor on a thumb or any toe. Do not place the sensor distal to an inflated pneumatic tourniquet or on any extremity with an arterial catheter in place. Avoid placing the sensor on any extremity with a blood pressure cuff or intravascular venous line. If you must place the sensor distal to the blood pressure cuff used with the Narkomed 4's noninvasive blood pressure monitor, you can disable pulse oximetry alarms during blood pressure cuff inflation with the SpO_2/NIBP Interlock (described later in this section).

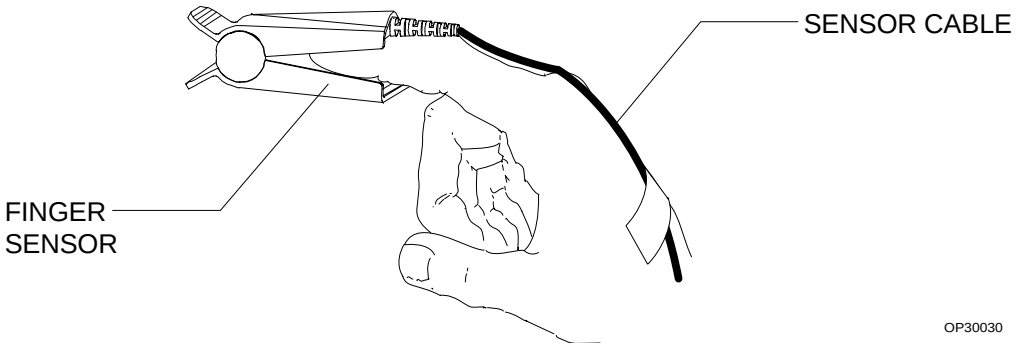
Section 5 - Operation
Pulse Oximetry Monitoring

Sensor Application

Apply the sensor so that the cable is on the back side of the hand. This places the light source on the nail side of the finger and the detector on the underside, allowing the sensor light source to shine down through the top side of the finger. The fingertip should lightly touch the stop at the end of the soft pad on the sensor. Make sure that the sensor's side walls are not pinching the finger or causing a pressure point anywhere on the finger. If the patient has long fingernails, the fingernail tip must extend over the stop to ensure that the fingertip lightly touches the stop. Do not tape the sensor shut. For best results, the patient's hand should be at the same elevation as the patient's heart.

NOTE: Check the sensor placement frequently. The sensor must be reapplied to a different appropriate digit at least once every 4 hours, or more often if clinical conditions indicate that the site should be changed.

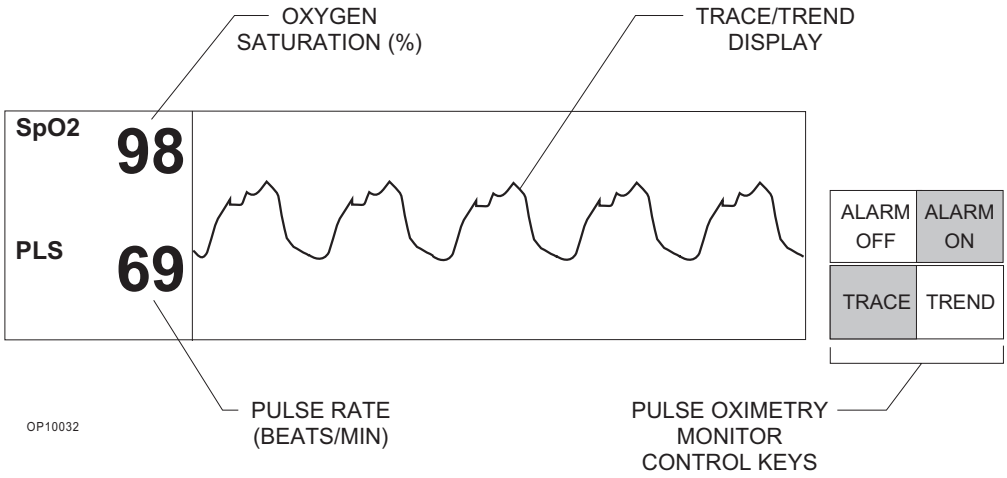
Regardless of clinical conditions, the sensor should not remain in the same location for more than 4 hours. Inspect the sensor site routinely to check circulatory status and skin integrity of the finger.



NOTE: Although the sensor is designed to minimize interference from ambient light, bright light sources (for example, surgical lamps and direct sunlight) may interfere with the accuracy of the measurement. If bright ambient light proves to be a problem, cover the sensor site with an opaque material, such as a towel or blanket.

Monitor Display

The pulse oximetry display area, located in the top part of the left side of the main display, shows numerical and graphical data for oxygen saturation and pulse rate.



The left side of the pulse oximetry display shows the numerical data:

- **SpO2**–indicates oxygen saturation. The display range is 0–100%, with a resolution of 1%.
- **PLS**–indicates pulse rate. The display range is 35–250 beats/minute, with a resolution of 1 beat/minute.

  NOTE: An audible tone is generated with each pulse beat. The pitch of the tone depends on the oxygen saturation value at the time: the higher the saturation value, the higher the pitch.

The middle of the pulse oximetry display shows the graphical trace or trend. When no pulse oximetry data is available, the trace/trend area is blank. The far right of the display has control keys which allow you to enable/disable alarms and select the trace or trend display. The area above the keys is reserved for displaying up to two alarm messages.

Pulse Oximetry Alarms

When the machine is turned on, the ALARM STBY key is highlighted, indicating that the visual and audible SpO_2 alarms are disabled. When an SpO_2 pulse is first read, the ALARM STBY key changes to ALARM OFF, and the ALARM ON key is highlighted. Once the alarms are turned on, they can be set to standby only by selecting the ALL STANDBY key in the Alarms Configuration Screen (see “Configuring the Monitoring System” in Section 5, “Operation, Monitoring System” for details).

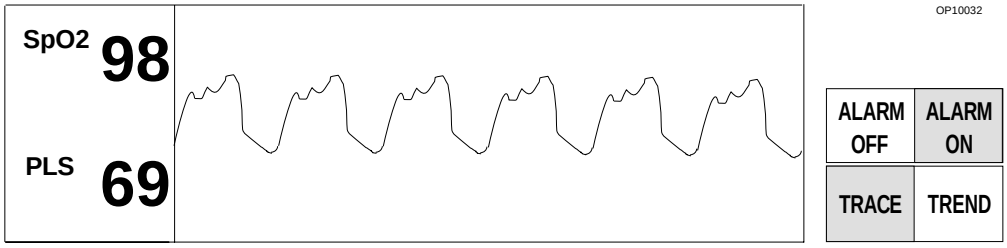
If the sensor is removed or disconnected or an oximeter hardware error occurs, numerical data is removed from the screen, the ALARM ON key is removed from the screen, and the ALARM OFF key is enabled (highlighted). When the error condition is corrected, the alarms are enabled again.

Setting Pulse Oximetry Alarms On/Off

- To turn the pulse oximetry alarms on, touch the ALARM ON key.
- To turn the pule oximetry alarms off, touch the ALARM OFF key.

Displaying the Waveform (Trace)

To display the plethysmography waveform, touch the TRACE key. The Narkomed 4 continuously transmits a real-time trace of the pulse seen by the sensor to the pulse oximetry measurement display area. The plethysmography waveform does not represent the SpO_2 value plotted against time, but rather the changes in light absorption seen by the sensor plotted against time.

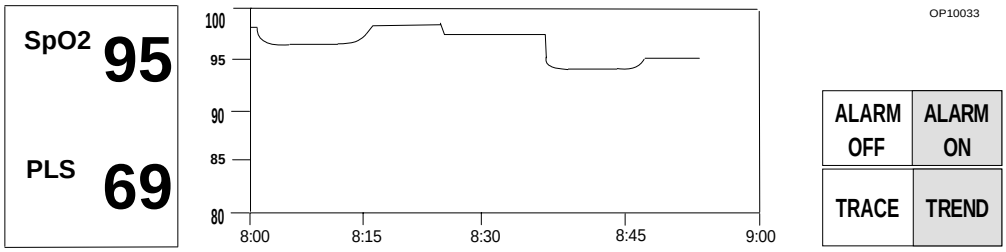


The plethysmography waveform provides a means of quickly assessing the regularity of the pulse. The pulse waveform may also be used to check the credibility of unusual SpO_2 or pulse rate measurements.

If the NIBP cuff is placed on the same arm as the pulse oximeter, no trace appears during cuff inflation.

Displaying the Trend

To display the pulse oximetry trend, touch the TREND key. This display provides up to 1 hour of the most recent readings for oxygen saturation.

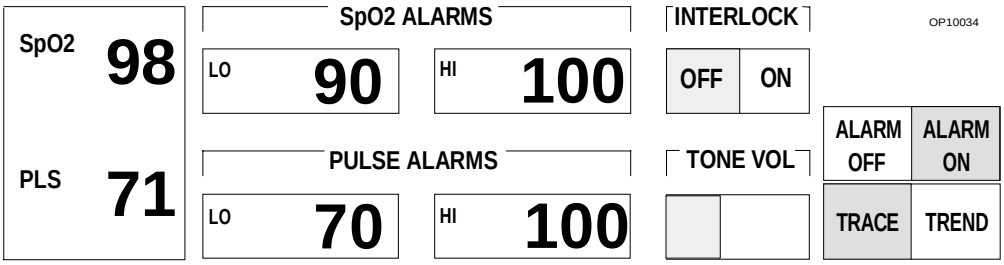


Using Setup Functions

Use the Monitor Setup screen to perform the following functions:

- set alarm limits for oxygen saturation and pulse rate
- enable the SpO_2/NIBP Interlock
- adjust the volume of the audio tone for each heartbeat

To invoke the Monitor Setup screen, press the MONITOR SETUP key on the main key panel.



Setting Pulse Oximetry Alarm Limits

To set high and low alarm limits for oxygen saturation and pulse rate:

1. Invoke the Monitor Setup screen.

2. Touch the key for the alarm limit you want to change. That key becomes highlighted.

3. Turn the selection dial to adjust the value within its allowable range. The range for pulse oximetry alarm limits is given in the following table.

Alarm Limit	Adjustment Range
Low oxygen saturation	50% to 99%
High oxygen saturation	51% to 100%
Low pulse rate	20 BPM to 249 BPM
High pulse rate	21 BPM to 250 BPM

4. To set the value, press the selection dial or select another function on the screen.

Setting SpO_2/NIBP Interlock

If you must place the finger sensor distal to the noninvasive blood pressure cuff, you can automatically disable the pulse oximetry alarms during blood pressure cuff inflation to prevent false pulse alarms.

To enable or disable the SpO_2/NIBP interlock:

1. Invoke the Monitor Setup screen.
2. To enable the interlock function, touch the INTERLOCK ON key.

   When this function is set to ON, pulse oximetry alarms are automatically disabled (as indicated by the Advisory message SPO2 ALARMS OFF) during noninvasive blood pressure cuff inflation and for a short period after cuff deflation.
3. To disable the interlock, touch the INTERLOCK OFF key.

Adjusting Pulse Tone Volume

The Narkomed 4 can annunciate an audio tone for each detected pulse. To adjust the volume of this tone:

1. Invoke the Monitor Setup screen.
2. Touch the TONE VOL key. A sample tone is generated to assist in setting the volume level.
3. Turn the selection dial to the desired volume.
4. To set the volume level, press the selection dial or select another function or screen.

NOTE: The tone volume can also be adjusted via the Datagrip on the remote display by highlighting the TONE VOL selection and turning the thumbwheel to the desired volume.

Pulse Oximetry Alarm Messages

The following list contains all Warning, Caution, and Advisory alarms associated with pulse oximetry monitoring.

NO SPO2 PULSE (Warning)

If the monitor does not sense a pulse for a period of ten seconds, the Warning message NO SPO2 PULSE appears on the central alarm display, and a continuously repeating audible alarm sounds. This alarm condition is cleared as soon as the monitor senses a pulse. During the 10-second period in which the monitor searches for a pulse, the monitor displays the last valid reading obtained before beginning the pulse search.

SPO2 PULSE LOW (Warning)	If the monitor measures a pulse rate lower than the low alarm limit, the Warning message SPO2 PULSE LOW appears on the central alarm display, and a continuously repeating audible alarm sounds. As soon as the monitor measures a pulse rate equal to or greater than the low pulse rate alarm limit, the alarm annunciation ceases.
SPO2 SAT LOW (Warning)	If the monitor measures an SpO_2 less than the low SpO_2 alarm limit, the Warning message SPO2 SAT LOW appears on the central alarm display, and a continuously repeating audible alarm sounds. As soon as the monitor measures an SpO_2 equal to or greater than the low alarm limit, alarm annunciation ceases.
SPO2 PULSE HIGH (Caution)	If the monitor measures a pulse rate greater than the high pulse rate alarm limit, the Caution message SPO2 PULSE HIGH appears on the central alarm display, and an intermittent audible alarm sounds. As soon as the monitor measures a pulse rate equal to or less than the high pulse rate alarm limit, the alarm annunciation ceases.
SPO2 SAT HIGH (Caution)	If the monitor measures an SpO_2 greater than the high SpO_2 alarm limit, the Caution message SPO2 SAT HIGH appears on the central alarm display, and an intermittent audible alarm sounds. As soon as the monitor measures an SpO_2 equal to or less than the high alarm limit, alarm annunciation ceases.
SPO2 ALARMS OFF (Advisory)	Any time the alarms have been disabled, including during sensor disconnection and the SpO_2/NIBP interlock, the Advisory message SPO2 ALARMS OFF appears on the central alarm display.
SPO2 SENSOR DISC (Advisory)	If a disconnection occurs at either the interface panel or between the sensor cable and interface cable, the Advisory message SPO2 SENSOR DISC appears on the central alarm display, and a single tone alarm sounds.
SPO2 MON ERROR (Advisory)	If the monitor detects an internal electronics failure that may prevent proper operation, the Advisory message SPO2 MON ERROR appears on the central alarm display. If this happens, contact an authorized North American Dräger service representative.

Section 5 - Operation
Pulse Oximetry Monitoring

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
Blank display area, and SPO2 SENSOR DISC and SPO2 ALARMS OFF alarm messages	Sensor disconnection	Check connections at interface panel cable and between sensor cable and interface panel.
SPO2 MON ERROR alarm message on central alarm display	Internal electronics failure	Contact NAD qualified technical service representative.
SpO_2 measurement does not agree with laboratory blood gas determination	Lab instrument used is multiwavelength type and reports "fractional" saturation	Monitor measures SpO_2 as a percentage of functional hemoglobin. Convert fractional measurement to functional measurement.
SpO_2 pulse rate measurements are erratic	Excessive patient motion	Make sure sensor is securely applied.
	Interference from Electrostatic Unit activation	Move Electrostatic Unit leads away from interface cable and sensor cables.
	Damaged sensor	Replace sensor.
	Patient has poor peripheral perfusion	Use different type of sensor if possible.
	Interference from ambient light sources	Shield sensor from ambient light sources.
Pulse rate measurement does not correlate with other monitors	Excessive patient motion	Make sure sensor is securely applied.

Overview

Inspiratory oxygen concentration is measured with a dual galvanic cell sensor, which is attached to the inspiratory valve dome. The sensor contains two independent electrochemical cells, or sensor halves. When the sensor takes in oxygen, an electrochemical reaction occurs within each cell. The oxygen monitor reads the voltage produced in each cell, computes an average for the two cells, and translates the average into an oxygen concentration measurement.

CAUTION: Never remove an oxygen sensor from its housing, except to replace it. If a sensor is removed from its housing, you must do the following before continuing normal operations:

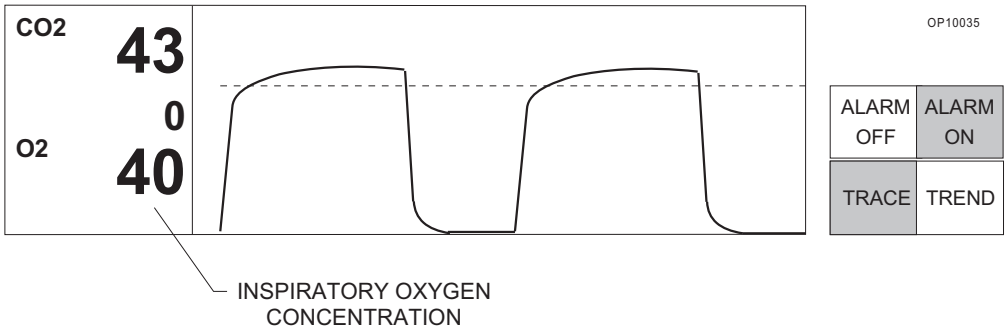
- Reinstall the sensor in the housing.
- Wait for a period equal to the time that the sensor spent outside the housing.
- Calibrate the sensor.

NOTE: When the machine is not in use, remove the oxygen sensor assembly from the inspiratory valve dome, and insert the inspiratory valve dome plug into the inspiratory valve dome.

Monitor Display

The oxygen monitoring display area is located in the central part of the left side of the main display. It shows the numerical value for inspiratory oxygen. The display range for oxygen is 0-100% with a resolution of 1%.

The display area is shared with carbon dioxide monitoring information. The trace/trend display and the touch keys to the right pertain to carbon dioxide monitoring. The area above the alarm touch keys is reserved for displaying up to two alarm messages, one of which may be an oxygen alarm message.



Section 5 - Operation
Oxygen Monitoring

Using Setup Functions

Alarm limit adjustments and oxygen sensor calibrations are done in the Monitor Setup screen. To invoke the Monitor Setup screen, press the MONITOR SETUP key on the main key panel.

Setting Alarm Limits

To adjust the oxygen concentration high or low alarm limit:

1. Invoke the Monitor Setup screen.

2. Touch the key for the alarm limit you want to change (LO or HI). That key becomes highlighted.

3. Turn the selection dial to adjust the value within its allowable range (18–99% for LO, 19–100% for HI).

   The HI setting must be greater than the LO setting. The LO setting must be less than the HI setting.

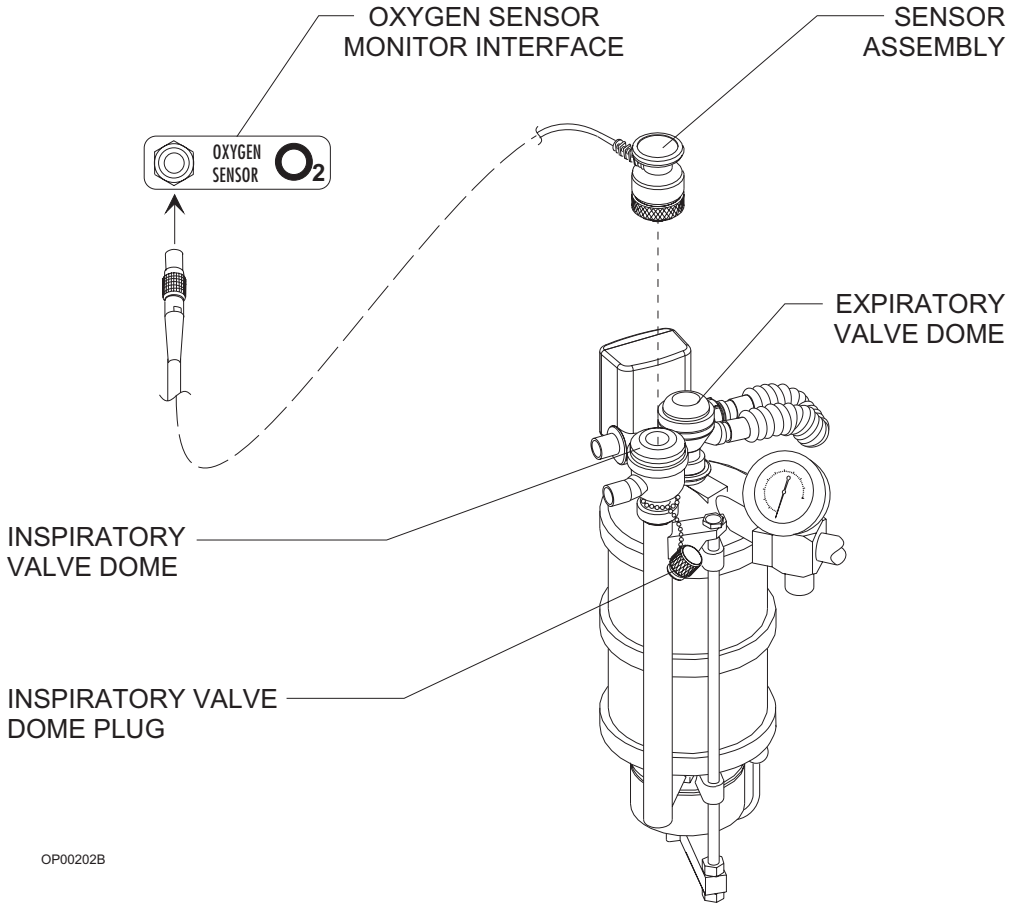
4. To set the value, press the selection dial or select another function on the screen.

Calibrating the Oxygen Sensor

To calibrate the oxygen sensor correctly, make sure it is exposed only to room air during the entire calibration period. You should calibrate the oxygen sensor as part of the daily preoperative setup of the anesthesia equipment.

1. Remove the sensor assembly from the inspiratory valve dome and close off the dome with the inspiratory valve dome plug. (Do not disassemble the sensor assembly further.)

2. Expose the sensor to ambient air only (21% oxygen concentration) and allow it to stabilize for several minutes. To ensure an ambient air exposure, hold the sensor away from any open part of the breathing system.



3. With the sensor exposed only to room air, press the MONITOR SETUP key, and then press the O2 CAL key.

   Calibration begins.

4. View the monitor screen to track progress of the calibration.

   - During calibration, the oxygen concentration value disappears, and the message CAL IN PROGRESS is displayed in the oxygen display area.

   - Following successful calibration, the currently sensed oxygen concentration appears in the oxygen display area. (If the calibration was not successful, the oxygen display area is blank. See “Unsuccessful Calibration” in this section for further information.)

Typically, calibration lasts less than 30 seconds. However, the time may vary depending on the amount of oxygen the sensor was exposed to before calibration.

Oxygen Exposure	Typical Calibration Time
21%	10 seconds
> 21%	up to 50 seconds

5. When the Narkomed 4 successfully completes the calibration, pull the inspiratory valve dome plug and reinsert the sensor assembly.

Unsuccessful Calibration

If, at the end of the calibration period, the oxygen display area is blank, the calibration was not successful. (This condition is also indicated by the advisory messages O2 NOT CAL and O2 ALARMS OFF.)

Causes and Solutions

An unsuccessful calibration can be caused by several conditions.

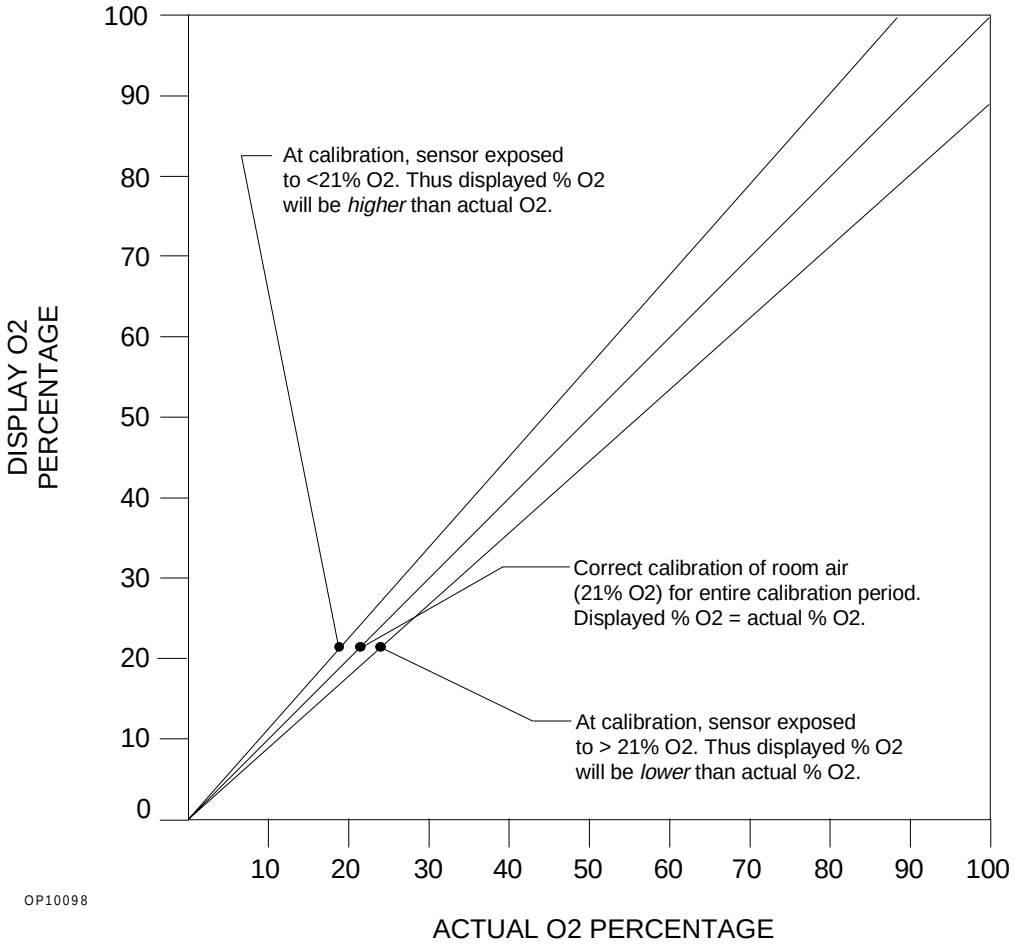
Cause	Solution
Sensor was exposed to an excessively lean or excessively rich oxygen calibration mixture.	Make sure that the sensor is exposed to room air only for the entire calibration period.
Sensor was exposed to a constantly changing calibration mixture.	Make sure that the sensor is exposed to room air only for the entire calibration period.
Sensor did not receive the proper waiting period.	If the sensor capsule was removed from the sensor assembly, a waiting period equal to the time that the capsule spent outside the sensor assembly (up to one week) is necessary prior to calibration. New sensors require a 15-minute waiting period.
Sensor is exhausted.	If the oxygen sensor has decayed beyond its useful service life (see the “Specifications” section of the manual), replace the decayed sensor with a new sensor and allow the proper waiting period.
Sensor is defective.	If there is too great a difference between the outputs of the two sensor halves, replace the defective sensor with a new sensor, and allow the proper waiting period prior to calibration.
Sensor is disconnected.	When the sensor is disconnected, the display area is blank, and the messages 02 SENSOR DISC, O2 NOT CAL, and O2 ALARMS OFF appear on the alarm display. If this happens, reconnect the sensor cord to the interface panel and try to calibrate the oxygen sensor again.

Section 5 - Operation
Oxygen Monitoring

Consequences

If the oxygen sensor is improperly calibrated, it can cause inaccurate measurements. When a calibration gas mixture is excessively rich or lean in oxygen, the Narkomed 4 will not complete an attempted calibration; however, if the calibration gas is rich or lean but is within certain limits, the Narkomed 4 will complete the calibration. As a result, when displaying sensor measurements, the Narkomed 4 displays an oxygen percentage either greater or less than the actual oxygen percentage. Therefore, make sure that the sensor is exposed only to room air during the entire calibration period.

The following figure illustrates the relationship between the calibration mixture and the accuracy of oxygen measurement.



Oxygen Alarm Messages

The following list contains all Warning, Caution, and Advisory alarms associated with oxygen monitoring.

INSP O2 LOW (Warning)

The Narkomed 4 continuously compares the current inspiratory oxygen percentage with the preset low oxygen alarm limit. If the measured oxygen concentration falls below the low alarm limit, the Warning message INSP O2 LOW appears on the central alarm display and a continuously repeating audible alarm sounds.

INSP O2 HIGH (Advisory)

If the measured inspiratory oxygen concentration exceeds the preset high alarm limit, the Advisory message INSP O2 HIGH appears on the central alarm display and a single-tone audible alarm sounds.

CAL O2 SENSOR (Advisory)

The Advisory message CAL O2 SENSOR appears on the central alarm display in the following instances:

- the oxygen sensor enters a noncalibrated state
- the Narkomed 4 is unable to calibrate the oxygen sensor
- more than 18 hours have elapsed since the last calibration

O2 SENSOR DISC (Advisory)

If the oxygen sensor cord becomes disconnected (or is damaged enough to cause an open circuit), the Advisory message O2 SENSOR DISC appears on the central alarm display and a single-tone audible alarm sounds.

SERVICE O2 (Advisory)

If the Narkomed 4 detects an internal electronic failure that would prevent proper operation, the Advisory message SERVICE O2 appears on the central alarm display. If this happens, contact a North American Dräger qualified technical service representative.

O2 NOT CAL (Advisory)

If the oxygen sensor enters a noncalibrated state, the Advisory message O2 NOT CAL appears on the central alarm display.

O2 ALARMS OFF (Advisory)

Any time that the oxygen alarms have been disabled, the Advisory message O2 ALARMS OFF appears on the central alarm display.

O2 CAL ERROR (Advisory)

During oxygen sensor calibration and monitoring, the Narkomed 4 checks for a difference between the outputs of the two sensor channels. If the difference exceeds a predetermined percentage, the Advisory message O2 CAL ERROR appears on the central alarm display.

During oxygen sensor calibration, the Narkomed 4 also checks the sensor's output against a range of acceptable output voltages. There are three possible causes for deviation from within this range:

- *Exhausted sensor*. If the sensor's capacity is exhausted, its output voltage will not meet the required minimum.

- *Incorrect calibration environment*. If the sensor is exposed to an excessively rich or lean oxygen mixture during calibration, the sensor's output will be above or below the acceptable output range.

- *Improper waiting period*. If the proper waiting period is not allowed for a new sensor or for a sensor removed from the sensor housing, the sensor's output may be above or below the acceptable output range.

If a sensor error condition is detected during monitoring, the Advisory message O2 CAL ERROR appears on the central alarm display and operation continues. Try to recalibrate the sensor; if the message remains, replace the sensor cell.

Low Oxygen Supply Whistle

If the Narkomed 4 is configured to do so, it sounds a 7-second whistle when the oxygen supply drops too low to properly pressurize the fresh gas circuit (below about 37 psi). If this alarm sounds, it cannot be silenced.

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
Display area remains blank when a reading is expected. O2 NOT CAL and O2 ALRM OFF message on central alarm display.	Needs calibration	Perform proper calibration. Remove sensor from breathing circuit. Make sure sensor is exposed to room air only, and press O2 CAL key.
O_2 analyzer fails to retain calibration. Alarm message O_2 NOT CAL appears on central alarm. Monitor continues to function but no data is reported.	Backup memory power not available	Check battery circuit breaker.
		Allow backup battery to recharge and recalibrate the analyzer.
	Hardware malfunction	Contact NAD qualified technical service representative.
Pressing O2 CAL key does not initiate calibration.	Sensor is disconnected	Reconnect sensor cord to input receptacle on anesthesia machine.
	Sensor cord is damaged	Replace housing/cord assembly.

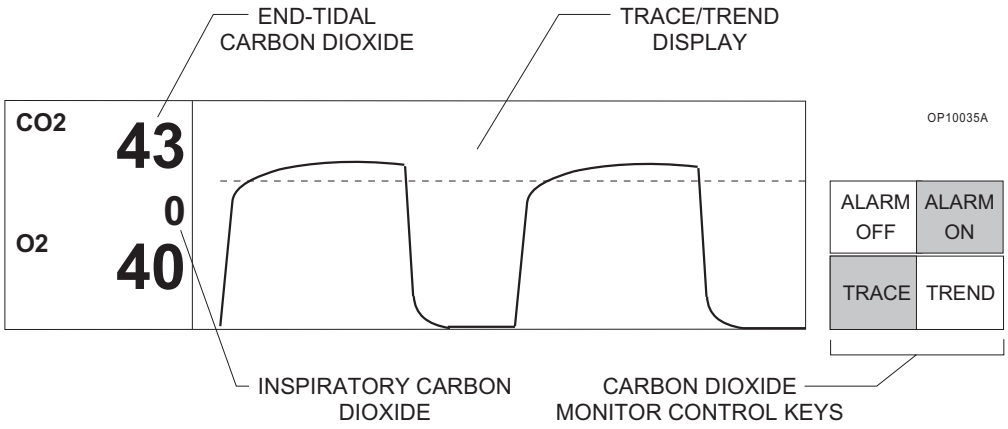
PROBLEM	POSSIBLE CAUSE	REMEDY
Pressing O2 CAL key initiates calibration, but display window remains blank at end of calibration period	Sensor is exposed to incorrect oxygen concentration	Expose sensor to room air for 21% calibration.
	Sensor exposed to constantly changing calibration mixture	
	Sensor capsule was removed from housing for a prolonged period	Allow a waiting period equal to duration of capsule removal.
	New capsule not given proper waiting period	Allow a 15 minute waiting period.
	Exhausted or defective sensor capsule	Replace sensor capsule. Allow a 15 minute waiting period.
O2 SENSOR DISC, and CAL O2 SENSOR messages appear on central alarm display during monitoring	Defective sensor housing and cable	Replace housing/cable assembly.
	Sensor cord is disconnected	Reconnect sensor cord to input receptacle on anesthesia machine.

Overview

The Narkomed 4 measures carbon dioxide concentrations with a nondispersive infrared analyzer, using a side-stream sample withdrawn at the Y-piece. The sample flow rate is set at 200 ml/min; it is not adjustable.

Monitor Display

The carbon dioxide display area, located in the central part of the left side of the main display, shows numerical and graphical carbon dioxide data.



Numerical values for inspiratory and end-tidal carbon dioxide appear on the left side of the carbon dioxide display:

- End-tidal carbon dioxide is displayed in large numerals. The end-tidal display range is 0–80 mmHg with a resolution of 1 mmHg.
- Inspiratory carbon dioxide is displayed in small numerals, directly below the end-tidal value. The inspiratory data measurement range is 0–76 mmHg with a resolution of 1 mmHg.

The middle of the carbon dioxide display shows the graphical trace or trend. The far right of the display has four keys which allow you to enable/disable alarms and select the trace or trend display. The area above the keys is reserved for displaying up to two alarm messages, one of which may be an oxygen alarm message.

NOTE: When the sample line is connected to the fresh gas outlet, the message FRESH GAS CIRCUIT ENABLED appears in the carbon dioxide and agent trace windows.

NOTE: There is approximately a one-second delay between the patient's respiration and the display of the carbon dioxide waveform on the display area. However, expiratory flow and breathing pressure waveforms are displayed simultaneously with the patient's breath. When displaying the carbon dioxide waveform with either the expiratory flow or breathing pressure waveform, there will be a misalignment on the time scale (the display's X axis), even though both waveforms provide information about the same breath.

Carbon Dioxide Alarms

For the first three minutes after power-up, the message CO2 TRACE WILL BE AVAILABLE AT HH:MM appears in the carbon dioxide trace/trend window. (HH = hour; MM = minute. This time is derived by adding 4 minutes to the system clock setting on power-up.) Because the alarms are disabled during this period, the ALARM ON key does not appear on the screen, and the ALARM OFF key is highlighted.

After the initial delay time has elapsed, the carbon dioxide waveform appears in the window, but no numerical data is displayed. The word WAVEFORM appears to the right of the CO2 label. When the first calibration is complete, the word WAVEFORM is replaced with the applicable numerical data. If no carbon dioxide is detected while the monitor is in the WAVEFORM mode, the ALARM OFF/STBY key is set to ALARM STBY, and the ALARM ON key is displayed. As soon as the monitor detects an end-tidal reading of at least 5 mmHg, the ALARM ON key is enabled (highlighted), and the ALARM STBY key changes to ALARM OFF. After the alarms are turned on, they can be set to standby only by selecting the ALL STANDBY key in the Alarms Configuration screen (see "Configuring the Monitoring System" in Section 5, "Operation, Monitoring System" for details).

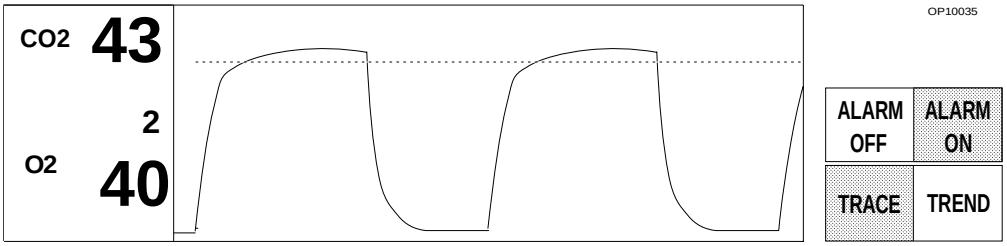
If a carbon dioxide or agent error is detected, the ALARM ON key and carbon dioxide waveform are removed, and the message DATA WILL BE AVAILABLE IN HH:MM is displayed (HH = hour; MM = minute). The ALARM ON key is also removed from the screen every time a carbon dioxide calibration is performed.

Setting Carbon Dioxide Alarms On/Off

- To turn the carbon dioxide alarms on, touch the ALARM ON key.
- To turn the carbon dioxide alarms off, touch the ALARM OFF key.

Displaying the Waveform (Trace)

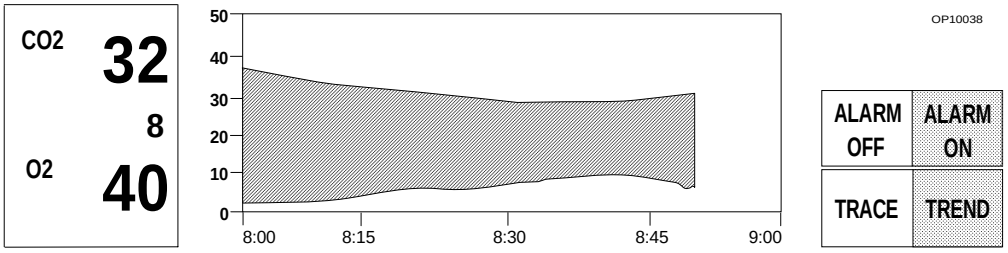
To display the carbon dioxide waveform, touch the TRACE key. A carbon dioxide waveform trace provides a means for a visual check of the patient's ventilation and of the patency of the patient breathing system. The study of the shape of the trace (capnography) can also provide diagnostic information about the patient's circulation and metabolism.



The resolution for the carbon dioxide waveform is 1 mmHg through its 0–50 and 0–80 mmHg range. For reference, a dashed line is displayed on the waveform display at 40 mmHg. When no carbon dioxide trace data is available, the trace/trend display shows a moving cursor at the baseline of the display area.

Displaying the Trend

To display the carbon dioxide trend, touch the TREND key. The carbon dioxide trend display provides up to one hour of the latest information for inspiratory and end-tidal carbon dioxide. The trend appears as a shaded area with end-tidal values at the top and inspiratory values at the bottom.



Section 5 - Operation
Carbon Dioxide Monitoring

Using Setup Functions

Use the Monitor Setup screen to adjust alarm limits and to inhibit automatic zero calibrations of the gas analyzer. To invoke the Monitor Setup screen, press the MONITOR SETUP key on the main key panel.

Setting Low and High Alarm Limits

To set low and high carbon dioxide alarm limits:

1. Touch the key for the alarm limit you want to change (LO or HI). That key becomes highlighted.

2. Turn the selection dial to adjust the value within its allowable range (10–79 mmHg for the LO limit, 11–80 mmHg for the HI limit.)

3. To set the value, press the selection dial or select another function on the screen.

Inhibiting Carbon Dioxide Calibration

The monitor calibrates itself 8 minutes after the system is turned on. Another calibration occurs 7 minutes later (15 minutes after the system is turned on), and then again 15 minutes later (30 minutes after the system is turned on). Thereafter, a calibration is performed every 60 minutes.

The HOLD CO2 CAL key in the Monitor Setup screen is used to inhibit the automatic zero calibration of the gas analyzer for up to eight minutes. If an automatic calibration becomes due during the hold period, the calibration will be performed immediately after the hold period is over.

- To inhibit gas analyzer calibrations for eight minutes, touch the HOLD CO2 CAL key.

- To end the calibration hold period before eight minutes, touch the HOLD CO2 CAL key again.

NOTE: This function can also be performed from the remote display by highlighting the HOLD CO2 CAL selection using the Datagrip trigger.

Carbon Dioxide Alarm Messages

The following list contains all Warning, Caution, and Advisory alarms associated with carbon dioxide monitoring.

APNEA - CO2 (Warning/Caution)

If the instantaneous CO_2 value does not cross an internally computed threshold for a period of 15 seconds, the Caution message APNEA - CO2 appears on the central alarm display, and an intermittent audible alarm sounds. If this condition persists for an additional 15 seconds (30 seconds total), a continuously repeating audible alarm sounds, the CO_2 display area is cleared, and the Caution message APNEA - CO2 is upgraded to a Warning on the central alarm display.

NOTE: If an apnea condition exists and the alarms are on, the analyzer will stay in the warmup mode.

ET CO2 LOW (Caution)

If the monitor measures an end-tidal carbon dioxide value less than the low alarm limit, an alarm is generated at the end of the breath. The Caution message ET CO2 LOW appears on the central alarm display, and an intermittent audible alarm sounds.

ET CO2 HIGH (Caution)

If the monitor measures an end-tidal CO_2 value that exceeds the high alarm limit, the Caution message ET CO2 HIGH appears on the central alarm display, and an intermittent audible alarm sounds.

INSP CO2 HIGH (Advisory)

If the inspiratory carbon dioxide value exceeds 5 mmHg, the Advisory message INSP CO2 HIGH appears on the central alarm display.

LINE BLOCK (Advisory)

If the sample line has become blocked, the CO_2 alarms are disabled after 15 seconds (as noted by the highlighted ALARM OFF key), the Advisory LINE BLOCK appears on the central alarm display, and the carbon dioxide display area is cleared.

Occlusion can be caused by a blocked filter, full water trap reservoir, water in the sample line, a kinked sample line, or blocked exhaust.

CO2 ALARMS OFF (Advisory)

Any time the carbon dioxide alarm is disabled, either during the automatic three-minute disable period or by touching the ALARM OFF key, the Advisory message CO2 ALARMS OFF appears on the central alarm display.

CO2/AGENT ERROR (Advisory)

If the monitor detects an internal electronics failure that would preclude proper carbon dioxide and agent monitoring, the Advisory CO2/AGENT ERROR appears on the central alarm display, and the carbon dioxide and agent monitoring display areas are cleared. There is a delay of approximately 6 minutes before the information is redisplayed while the monitor attempts to clear the error and resume normal operation.

If the error is not cleared, refer to “Problem Resolution” later in this section.

Section 5 - Operation
Carbon Dioxide Monitoring

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
Unusually low End-tidal and Inspiratory CO_2 readings	Leak in sample line, between line connections, or between water trap and mounting bracket (room air dilutes sample)	Make sure all connections are tight and sample line is intact.
Slow response	Occlusion in adapter, sample line, or water trap reservoir	Replace occluded component.
Only dashes displayed on CO_2 trace	Sample line disconnected	Reconnect sample line.
	Zero calibration in progress	Wait until calibration procedure is over.
CO2/AGT ERR message on central alarm display	Internal fault	Contact NAD qualified technical service representative.
	Wrong agent selected	Select correct agent.
	Span calibration required	Perform span calibration.

PROBLEM	POSSIBLE CAUSE	REMEDY
Periodic pump noise	Occlusion in adapter, sample line, or water trap	Replace occluded component.
	Zero calibration in progress	Wait until calibration procedure is over.
LINE BLOCK message on central alarm display	Sample flow is less than 75 ml/min	Increase the sample flow setting in the Monitor Setup screen.
	Blocked filter, full water trap reservoir, water in the sample line, kinked sample line, blocked exhaust, and/or missing sample line	Check for each condition. Replace occluded component(s) and unkink lines.

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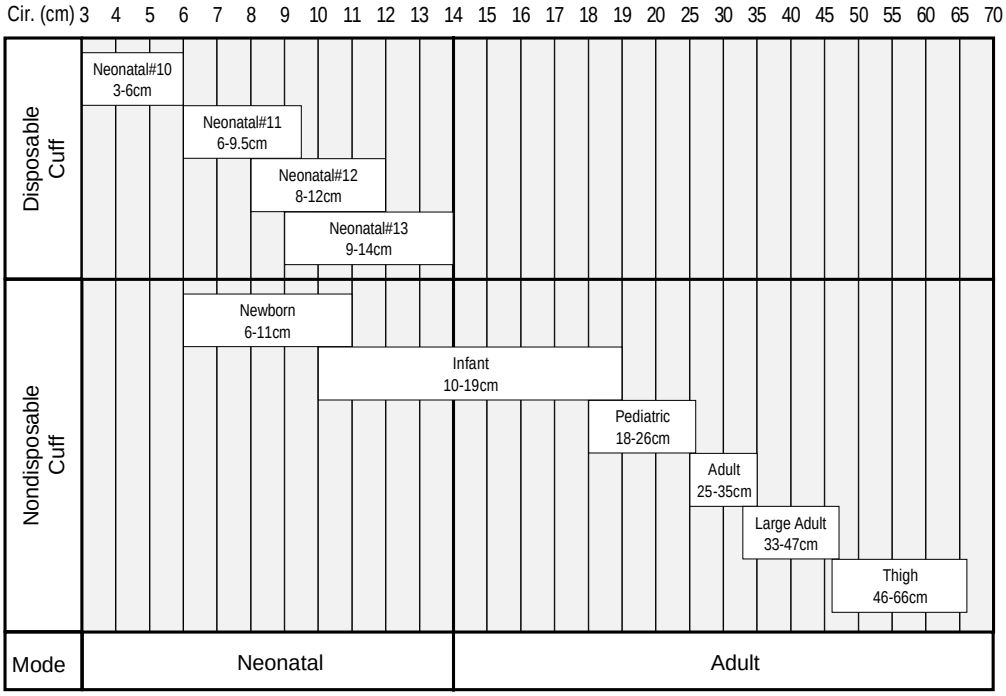
Overview

The Narkomed 4 uses oscillometric means to measure the patient's noninvasive systolic, diastolic, and mean arterial blood pressure, as well as the pulse rate. The oscillometric method employs a pressure cuff without transducers and microphones. Instead, a pressure transducer and microprocessor within the monitor translate cuff pressure oscillations into blood pressure readings. A full range of blood pressure cuffs, from neonatal through large adult, is supported. To ensure proper readings, only North American Dräger cuffs should be used.

Selecting the Noninvasive Blood Pressure Cuff

When preparing for a case that includes noninvasive blood pressure monitoring, be sure to choose the correct cuff size and mode and to place the cuff correctly. Use the following table to select the appropriate cuff size and NIBP measurement mode. If you don't have a tape measure, use the INDEX and RANGE lines marked on the cuff as described in *Placing the Cuff*, later in this section.



When using the neonatal, newborn, or infant cuff size, you must select the Neonatal measurement mode in the Monitor Setup screen (see *Selecting Adult/Neonatal Measurement Mode* later in this section). The Neonatal mode should be used only for patients with a limb circumference of less than 14 centimeters; using the Neonatal mode with larger cuffs for larger patients may produce unreliable measurements. When using the pediatric, adult, large adult, or thigh cuff, you must select the Adult mode. You must also select the Adult mode for infants who have a limb circumference greater than 14 cm, even if they require an infant cuff.

Section 5 - Operation
Noninvasive Blood Pressure Monitoring

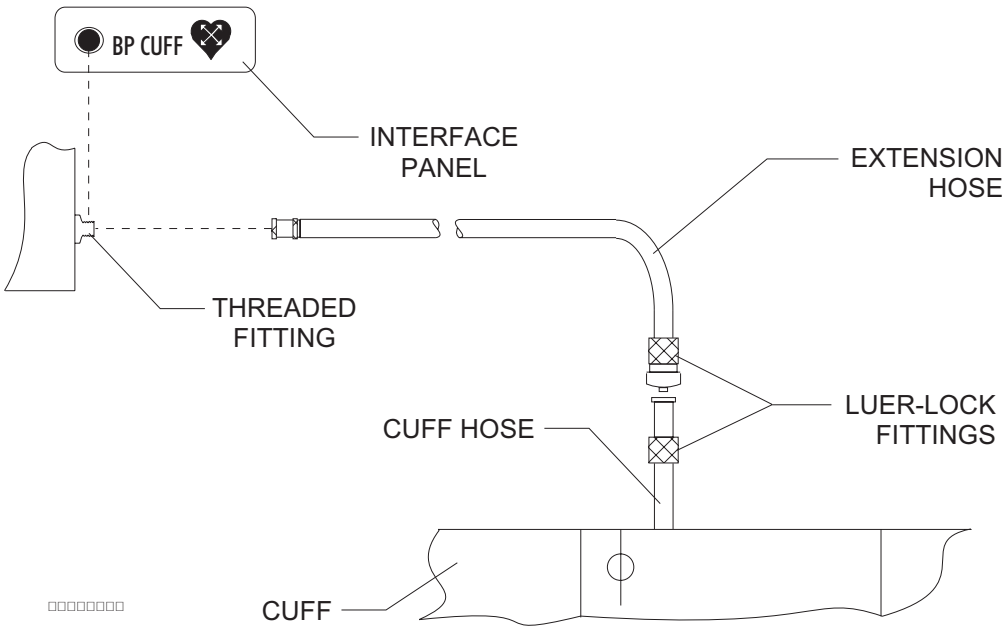
Connecting the Cuff

To connect the cuff:

1. Connect the cuff hose (attached to the cuff) to the Luer lock fitting on one end of the extension hose.

2. Connect the threaded fitting on the other end of the extension hose to the fitting on the patient interface panel labeled BP CUFF.

3. Make sure that the hoses are not pinched or kinked.



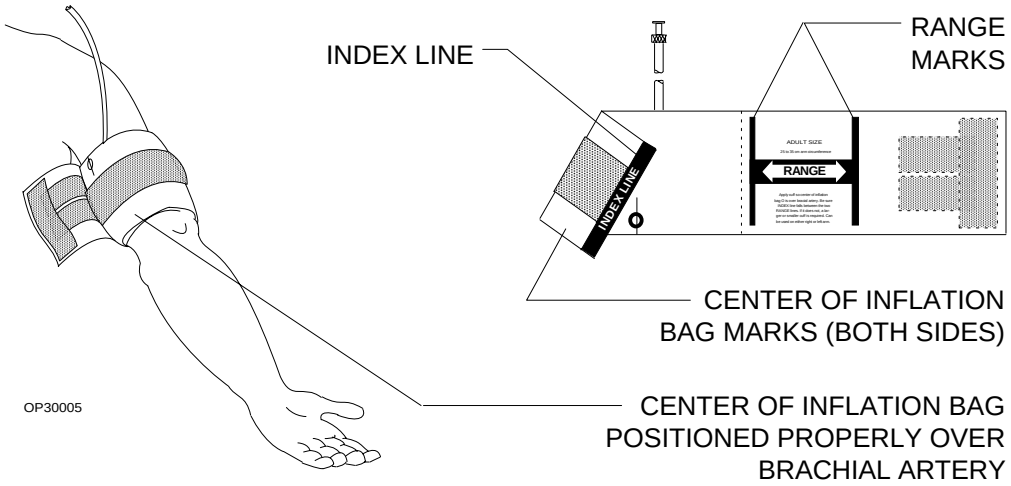
Placing the Cuff

To apply the pressure cuff:

1. Place the center of the cuff inflation bag over the artery (for the brachial artery, place the bag on the inside of arm, above the elbow).

2. Make sure the cuff fits securely on the limb and that the INDEX line falls between the two RANGE lines. If the INDEX line does not fall between the RANGE lines, select a smaller or larger cuff. The cuff can be used on either a left or right extremity, but the left is preferred.

   NOTE: Do not place the cuff on a limb being used for infusion.



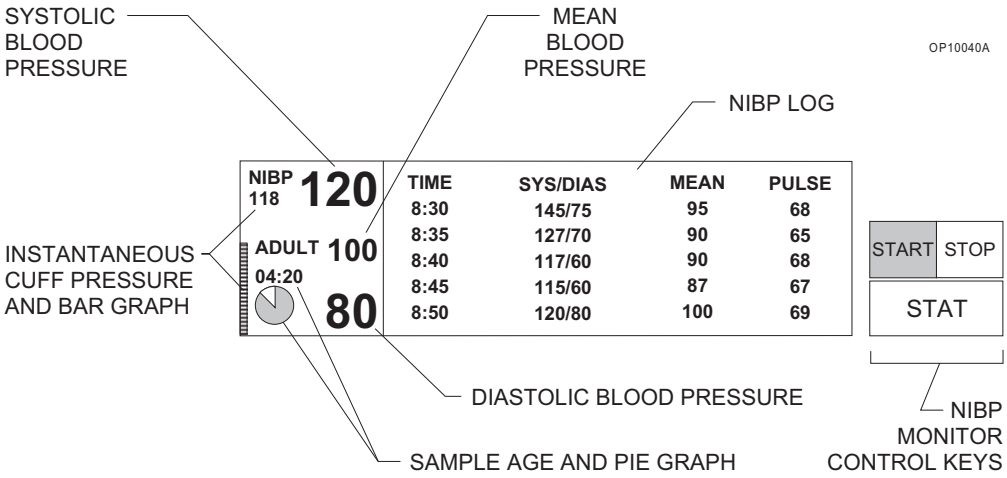
The cuff should be positioned at the same level as the patient's heart for an accurate measurement. Placing the cuff above the heart causes the reading to be falsely low; placing the cuff below the heart causes the reading to be falsely high. In instances when you cannot place the cuff at the same level as the heart, use the following general rule:

- For every inch above the heart, add 1.8 mmHg to the reading.
- For every inch below the heart, subtract 1.8 mmHg from the reading.

Section 5 - Operation
Noninvasive Blood Pressure Monitoring

Monitor Display

The NIBP display area, located at the bottom left side of the main display, shows numerical and graphical information from periodic blood pressure measurements.



The left side of the NIBP measurement display area contains the following information. Display ranges are noted where they apply. Resolution for pressure readings is 1 mmHg.

- Systolic blood pressure (adult: 60–260 mmHg; neonatal: 40–260 mmHg)
- Diastolic blood pressure (adult: 25–260 mmHg; neonatal: 15–260 mmHg)
- Mean blood pressure (adult: 35–260 mmHg; neonatal: 25–260 mmHg)
- Instantaneous cuff pressure, shown numerically and as a bar graph (during inflation only)
- Sample age (elapsed time since last measurement), shown numerically and as a pie graph
- Pressure mode selection (adult or neonatal)

When a measurement is in progress, the instantaneous cuff pressure is shown as a vertical bar graph. The numeric value for instantaneous pressure is displayed directly below the NIBP label.

The sample age is shown both as a numeric value and as a pie graph with respect to the preset sample interval. For example, if it has been 10 minutes since the last measurement and the sample interval has been set to 15 minutes, the sample age display will indicate an age of 10 minutes and two-thirds of the pie graph will be filled, indicating a relatively old sample. The NIBP mode, ADULT or NEO, appears directly above the numerical value.

The middle portion of the NIBP display shows the NIBP log. The NIBP log is a tabular listing of NIBP measurements, including the time at which the measurement occurred, the systolic, diastolic, and mean blood pressure, and NIBP pulse (range: 40-250 BPM with a resolution of 1 BPM). Each time the monitor completes a reading, it sounds a single tone. The NIBP log can store up to 50 events (readings), which you can scroll through by turning the selection dial.

The far right of the NIBP display has control keys which are used to select the NIBP measurement mode. The area above the keys is reserved for displaying up to two alarm messages.

Invoking the NIBP Measurement Mode

The NIBP monitor has three modes of operation: Automatic, Standby, and Stat.

Automatic Mode

To invoke the Automatic mode of operation:

1. Touch the START key.

2. A measurement is started and the alarms are enabled. All subsequent measurements occur at the preset interval. (For more information, see *Setting the NIBP Interval* in this section.)

The NIBP measurement is displayed for a period equal to the selected interval. For example, if you take a measurement while the interval is set to 5 minutes, and, after 2 minutes of operation, you press the STOP key to place NIBP monitoring in the Standby mode, the previous reading remains in the display area for approximately 3 more minutes. After the time interval has elapsed, the NIBP display area is cleared.

Standby Mode

To invoke the Standby mode:

1. Touch the STOP key.

2. The cuff is immediately deflated, measurements are suspended, and NIBP alarms are disabled.

Section 5 - Operation
Noninvasive Blood Pressure Monitoring

Stat Mode

To invoke the maximum rate measurement mode:

1. Touch the STAT key.

2. The advisory message NIBP STAT MODE appears on the central alarm display.

Compared to the Automatic mode, the sample duration time in the Stat mode is slightly reduced, and the time between samples is minimized to approximately 3 seconds. The Stat mode is automatically exited after 5 minutes, and the monitor enters the Automatic mode with the previously selected sample interval.

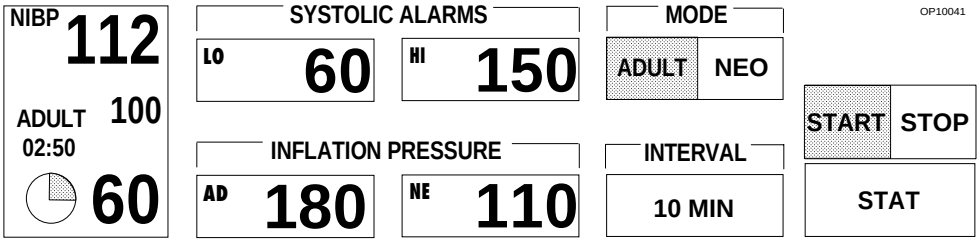
To disable the Stat mode, touch either the START or STOP keys.

Using Setup Functions

Use the Monitor Setup screen to perform the following functions:

- set high and low alarm limits for systolic pressure
- select Adult or Neonatal mode
- set initial cuff inflation pressure
- configure the time interval between measurements

To invoke the Monitor Setup screen, press the MONITOR SETUP key on the main key panel.



Setting Systolic Pressure Alarm Limits

To set NIBP high and low alarm limits:

1. Invoke the Monitor Screen screen.

2. Touch the key for the alarm limit you want to change (LO or HI). That key becomes highlighted.

3. Turn the selection dial to adjust the value within its allowable range (40–259 mmHg for LO, 41–260 mmHg for HI).

4. To set the value, press the selection dial or select another function on the screen.

Selecting Adult/Neonatal Mode

The Adult mode (ADULT) is the default selection and should be used with pediatric, adult, and thigh cuffs. In the Adult mode, the default cuff inflation pressure is 180 mmHg. When using an infant cuff for an infant with a limb circumference greater than 14 cm, select the Adult mode and set the inflation pressure to 110 mmHg.

When using neonatal or newborn cuffs, select the Neonatal mode (NEO). When the Neonatal mode is selected, the default cuff inflation pressure is 120 mmHg.

To select the measurement mode:

1. Invoke the Monitor Setup screen.
2. Touch the key for the mode you want (ADULT or NEO). That key will become highlighted.

Setting Initial Cuff Pressure

This setting determines the initial cuff inflation pressures for the Adult and Neonatal modes. To set the initial cuff pressure:

1. Invoke the Monitor Setup screen.
2. Touch the key for the pressure you want to set (AD or NE). That key will become highlighted.
3. Turn the selection dial to set the pressure value within its allowable range (80–250 mmHg for AD, 80–180 mmHg for NE). The default cuff inflation pressure is 180 mmHg in the Adult mode and 120 mmHg in the Neonatal mode.
4. To set the value, press the selection dial or select another function on the screen.

Setting the NIBP Interval

The NIBP interval regulates the amount of time between blood pressure measurements. To change the interval between the blood pressure measurements:

1. Invoke the Monitor Setup screen.
2. Touch the INTERVAL key. The current interval value will become highlighted.
3. Turn the selection dial to set the interval value within its allowable range (1–30 minutes in 1-minute increments). The default interval is 5 minutes.

NOTE: When the selected interval is 5, 10, 15, 20, or 30 minutes, the automatic sampling time is synchronized with the internal clock. For example, if the START or STAT key is touched at 10:12, and the 20 minute interval has been selected, samples will be taken immediately, then at 20 minutes and 40 minutes after the hour, and on the hour.

4. Press the selection dial to set the value or select another function on the screen.

NOTE: The interval can also be set via the Datagrip on the remote display by highlighting the INTERVAL selection and turning the thumbwheel to the desired interval value.

NIBP Alarm Messages

The following list contains all Warning, Caution, and Advisory alarms associated with noninvasive blood pressure monitoring.

NIBP SYSTOLIC LO (Caution)

If the measured systolic blood pressure falls below the low systolic alarm limit, the Caution message NIBP SYSTOLIC LO appears on the central alarm display and an intermittent audible alarm sounds. You can manually disable the low systolic blood pressure alarm by touching the STOP key to enter the Standby mode.

NIBP SYSTOLIC HI (Caution)

If the measured systolic blood pressure exceeds the high systolic alarm limit, the Caution message NIBP SYSTOLIC HI appears on the central alarm display and an intermittent audible alarm sounds. You can manually disable the high systolic blood pressure alarm by touching the STOP key to enter the Standby mode.

CHECK BP CUFF (Advisory)

If the monitor cannot take a measurement because the cuff is improperly positioned, the Advisory message CHECK BP CUFF will appear on the central alarm display. The monitor will attempt another reading. If after three tries no reading can be obtained, the monitor will wait until the sample time interval has elapsed and will try again. The message is cleared when the next interval starts, when you touch the START or STAT key between intervals, or when a valid measurement is taken.

BP CUFF MOTION (Advisory)

If the monitor cannot take a measurement because of cuff movement, the message BP CUFF MOTION will appear on the central alarm display. The monitor will attempt another reading. If after three tries no reading can be obtained, the monitor will wait until the sample time interval has elapsed and will try again. The message is cleared when the next interval starts, when you touch the START or STAT key between intervals, or when a valid measurement is taken.

BP CUFF LEAK (Advisory)	If the monitor attempts to inflate a completely disconnected or leaky cuff, the Advisory message BP CUFF LEAK appears on the central alarm display, a single tone audible alarm sounds, and the STOP key is highlighted. The message is cleared as soon as you touch the START or STAT key.
IRREG NIBP PULSE (Advisory)	If the monitor cannot take a measurement due to an erratic pulse, the message IRREG NIBP PULSE appears on the central alarm display. The monitor will attempt another reading. If after three tries no reading can be obtained, the monitor will wait until the sample time interval has elapsed and will try again. The message is cleared when the next interval starts, when you touch the START or STAT key between intervals, or when a valid measurement is taken.
WEAK NIBP PULSE (Advisory)	If the monitor cannot take a measurement due to a weak or absent pulse, the Advisory message WEAK NIBP PULSE appears on the central alarm display. The monitor will attempt to get another reading. If after three tries no reading can be obtained, the monitor will wait until the sample time interval has elapsed and will try again. The message is cleared when the next interval starts, when you touch the START or STAT key between intervals, or when a valid measurement is taken.
CUFF PRES LOW (Advisory)	If the monitor cannot take a measurement due to an initial cuff inflation pressure that is too low, the Advisory message CUFF PRES LOW appears on the central alarm display. The monitor will attempt another reading using a higher inflation pressure. (The inflation pressure will be increased by 40 mmHg in the Adult mode and by 20 mmHg in the Neonatal mode.) If after three tries no reading can be obtained, the monitor will wait until the sample time interval has elapsed and will try again. The message is cleared when the next interval starts, when you touch the START or STAT key between intervals, or when a valid measurement is taken.
HIGH NIBP PULSE (Advisory)	If the monitor cannot take a measurement due to an artifact, such as movement of the arm with the cuff, or a high pulse rate, the Advisory message HIGH NIBP PULSE appears on the central alarm display. The monitor will attempt another reading. If after three tries no reading can be obtained, the monitor will wait until the sample time interval has elapsed and will try again. The message is cleared when the next interval starts, when you touch the START or STAT key between intervals, or when a valid measurement is taken.

LOW NIBP PULSE (Advisory)	If the monitor cannot take a measurement due to an improperly positioned cuff or a low pulse, the Advisory message LOW NIBP PULSE appears on the central alarm display. The monitor will attempt another reading. If after three tries no reading can be obtained, the monitor will wait until the sample time interval has elapsed and will try again. The message is cleared when the next interval starts, when you touch the START or STAT key between intervals, or when a valid measurement is taken.
SERVICE NIBP (Advisory)	If the monitor detects an internal electronic or pneumatic failure that would prevent proper operation, the Advisory message SERVICE NIBP appears on the central alarm display. If this happens, contact a qualified North American Dräger technical service representative.
NIBP STAT MODE (Advisory)	When the STAT key is touched to invoke the NIBP maximum rate measurement mode, the Advisory NIBP STAT MODE is displayed on the central alarm display.

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
BP CUFF LEAK message on central alarm display.	Cuff hose or extension hose disconnected	Reconnect hoses.
	Excessive cuff leak	Replace cuff.
CHECK BP CUFF message on the central alarm display.	Center of inflation bag not positioned over artery	Position cuff according to instructions.
BP CUFF MOTION message on the central alarm display.	Outside "noise" interfering with measurement	Take care not to tap or squeeze cuff during measurement.
	Patient movement	Allow monitor to retry.
IRREG NIBP PULSE message on the central alarm display.	Erratic pulse	Allow monitor to retry.
WEAK NIBP PULSE message on the central alarm display.	Weak or absent pulse	Check patient condition.
CUFF PRES LOW message on the central alarm display.	Initial cuff inflation pressure selected is too low	Adjust initial cuff inflation pressure.
	Sudden change in blood pressure	Allow monitor to retry until measurement is obtained.
HIGH NIBP PULSE message on the central alarm display.	Artifact (e.g. movement of the arm with the cuff) or high pulse rate	Check patient condition if no artifacts occurred.

PROBLEM	POSSIBLE CAUSE	REMEDY
LOW NIBP PULSE message on the central alarm display.	Cuff not properly positioned or low pulse rate	Check cuff position and patient condition.
SERVICE NIBP message on the central alarm display.	Internal electronic or pneumatic failure	Contact qualified NAD technical service representative.

Section 5 - Operation
Breathing Pressure Monitoring

Overview

Breathing pressure is measured with a solid-state pressure transducer that can sense pressure at either the absorber or patient Y-piece, depending on which pilot line is used.

Choice of Breathing Pressure Monitoring Location

North American Dräger has no control over the type of breathing hoses and Y-pieces that are ultimately used with NAD absorber systems and pressure monitors—specifically, whether such user-supplied components include a terminal for pressure monitoring at or near the Y-piece. In order to ensure that some form of pressure monitoring is always used, provisions have been made for pressure monitoring at the absorber (the quick-connect fitting on the absorber gas pipe). However, do not construe this provision for monitoring at the absorber as a recommendation from North American Dräger for this pressure monitoring location.

In fact, arguments can be made for pressure monitoring at either the Y-piece or at the absorber. Advocates of Y-piece pressure monitoring first claim that it more accurately reflects the pressure developed in the patient's lungs. They also claim that a blocked breathing system can be more easily detected with this method when compared with pressure monitoring at the absorber.

For example, if the inspiratory breathing hose became kinked or blocked during automatic ventilation, the ventilator bellows would continue to cycle against the blocked hose. A pressure monitor connected at the Y-piece (downstream of the occlusion) could sense either an absence of pressure fluctuation and alarm, or could sense a reduced pressure fluctuation (below the threshold pressure alarm limit) and alarm. In contrast, a pressure monitor connected at the absorber (upstream of the occlusion) could sense a pressure fluctuation above the threshold pressure alarm limit, and thus would not alarm. (Both of these scenarios assume that the occlusion does not cause a peak pressure high enough to activate the peak pressure alarm, which is meant to detect pressures likely to cause barotrauma.)

However, North American Dräger disagrees with the idea of relying on pressure monitoring to detect a blocked breathing circuit. Carbon dioxide monitoring and respiratory flow monitoring provide superior detection of blocked breathing paths when compared to pressure monitoring, which detects such conditions only in some instances. North American Dräger pressure monitors are therefore not promoted for detection of blocked breathing paths.

Further, Y-piece pressure monitoring has several disadvantages that could collectively cause the operator to neglect connecting the pressure monitoring pilot line. Examples include increased contamination of the pilot line due to its proximity to secretions, buildup of condensation within the pilot line, and the introduction of additional disconnection points (if the pilot line connects to a 15 mm adapter).

In conclusion, the responsibility for the selection of pressure monitoring at either the absorber or the Y-piece rests with you, the operator. Your clinical considerations, over which North American Dräger has no control, must be included in this decision. North American Dräger is available to discuss with you in detail the positive and negative aspects of each pressure monitoring approach.

Installing the Breathing Pressure Pilot Line

North American Dräger anesthesia systems are supplied with two breathing pressure pilot lines:

- a short line for breathing pressure monitoring at the absorber
- a long line for breathing pressure monitoring at the Y-piece

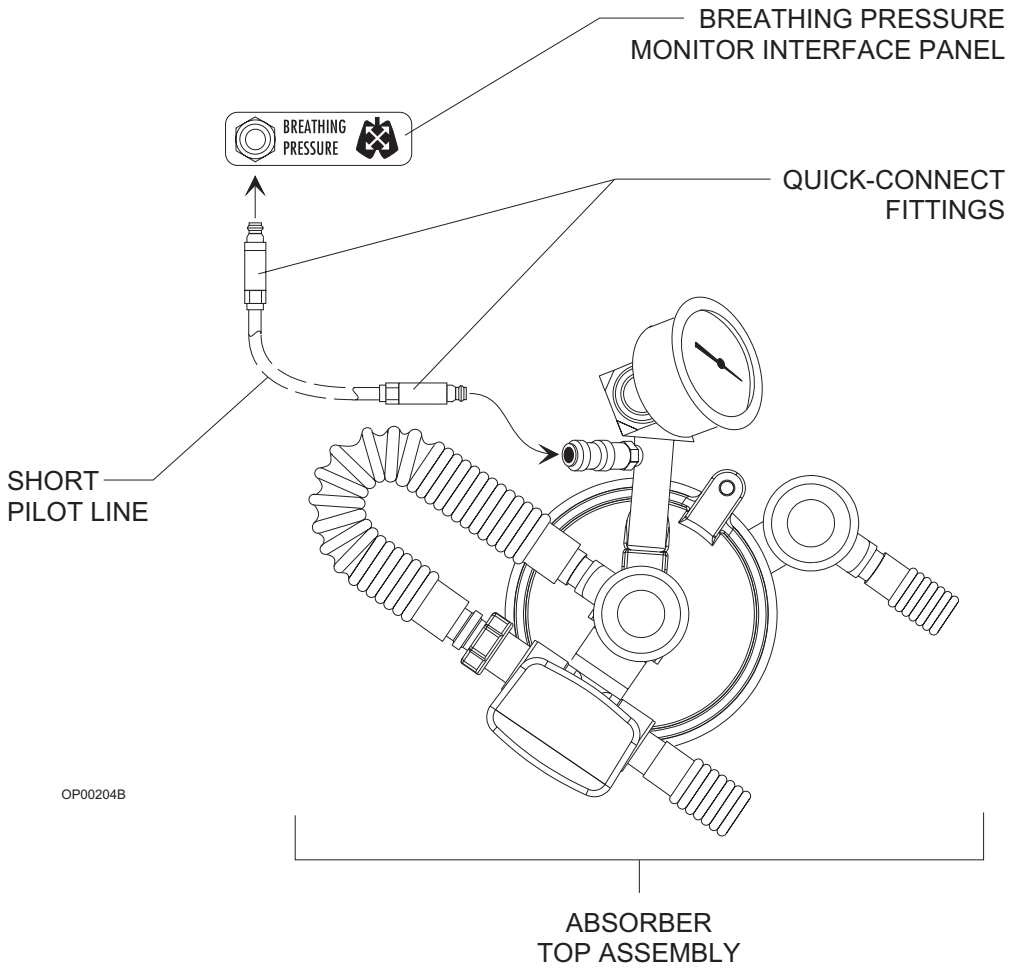
With either type of pilot line, check the line for obstructions and moisture accumulation before and during use.

For Absorber Monitoring

For breathing pressure monitoring at the absorber, install the short pilot line (which has quick-connect fittings on both ends) as follows:

1. Connect one end of the pilot line to the quick-connect fitting mounted on the rear of the gas pipe that extends from the absorber top assembly.

2. Connect the other end of the pilot line to the breathing pressure monitor interface.



Section 5 - Operation
Breathing Pressure Monitoring

For Y-piece Monitoring

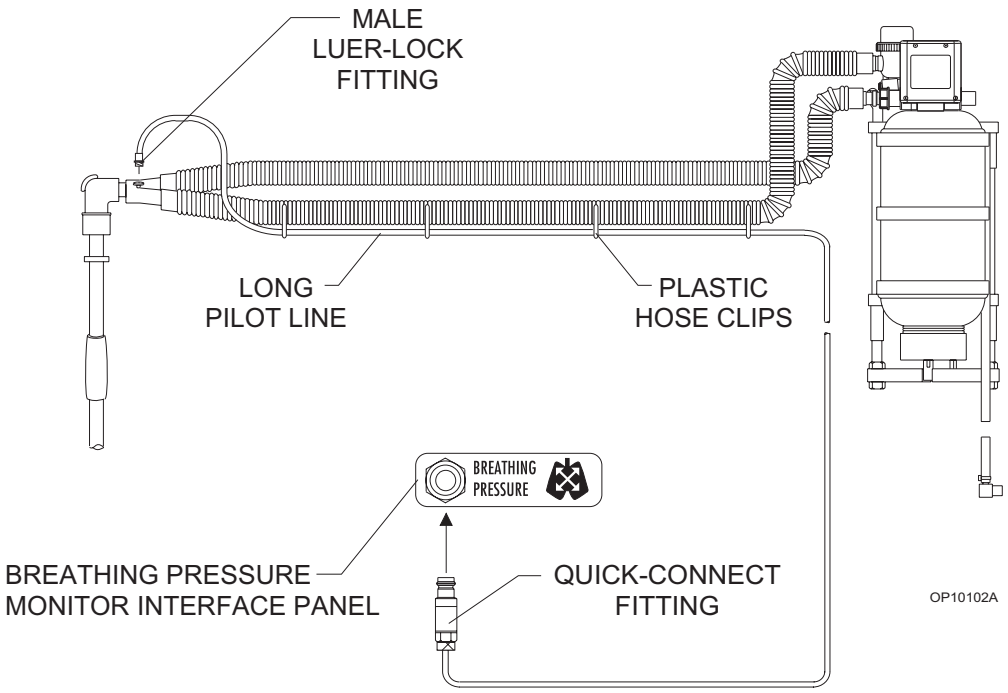
For breathing pressure monitoring at the patient Y-piece, install the long pilot line (which has a quick-connect fitting on one end and a Luer-type fitting on the other end) as follows:

1. Connect the quick-connect fitting on the pilot line to the breathing pressure monitor interface.

   NOTE: The quick-connect fitting on the absorber is self-closing. You can leave it unused when installing the long pilot line for Y-piece monitoring.

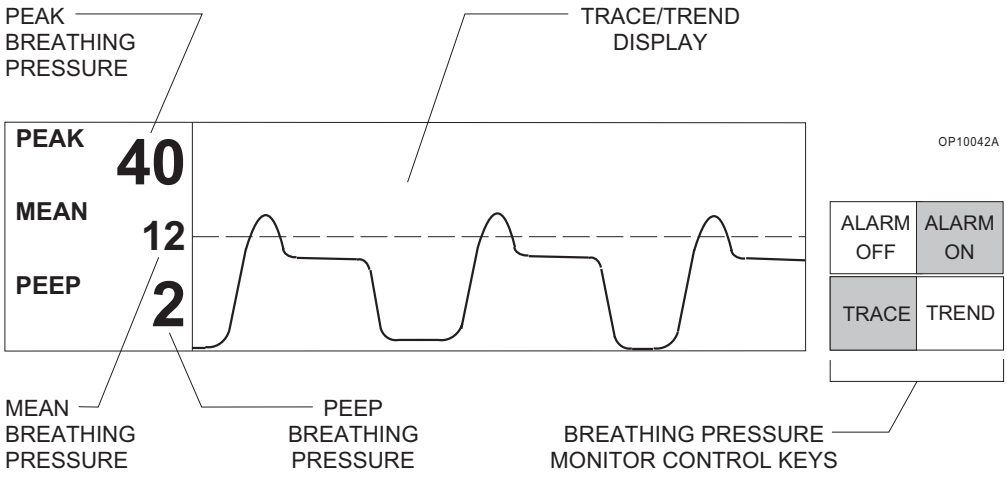
2. Connect the Luer fitting on the other end of the pilot line to the Luer fitting on either the patient Y-piece or a 15 mm adapter on the patient side of the Y-piece.

3. Using the four plastic hose clips attached to the pilot line, mount the pilot line on either of the breathing hoses leading to the Y-piece.



Monitor Display

The breathing pressure display area, located in the top part of the right side of the main display, shows numerical and graphical airway pressure data.



Numerical values for peak, mean, and positive end-expiratory pressure (PEEP) appear on the left side of the breathing pressure display. These breathing pressure values are displayed if the data is available (i.e. when the ventilator is on). If the data is not available (i.e. ventilator is off), the values do not appear.

The numeric display range is from -10 to at least 125 cmH_2O, with a 1 cmH_2O resolution.

- **PEAK Breathing Pressure**—The highest instantaneous pressure value for each breath
- **MEAN Breathing Pressure**—The average of all of the instantaneous pressure values recorded during each breath
- **PEEP Breathing Pressure**—The breathing pressure at the end of exhalation

The middle of the breathing pressure display shows the graphical trace or trend. The far right of the display has control keys which allow you to enable/disable alarms and select the trace or trend display. The area above the keys is reserved for displaying up to two alarm messages.

Pressure Alarms

To ensure that the pressure alarms are active during automatic ventilation, the pressure alarms disable function is tied into the ventilator power switch. When you turn the ventilator power switch on, the apnea alarm is automatically enabled, even if you previously disabled the apnea alarm with the ALARM OFF key. When you turn the ventilator power switch off, the apnea alarm remains enabled; if you want to disable the alarm, you must touch the ALARM OFF key.

The power-up default with the ventilator off is ALARM STBY (key is highlighted), which disables the visual and audible apnea pressure alarms. If the ventilator is turned on, the apnea alarms are automatically enabled; the ALARM ON key is highlighted, and the ALARM OFF/STBY key is removed from the screen. When the ventilator is turned off, the ALARM OFF key is displayed. Once the alarms are turned on, they can be set to standby only by selecting the ALL STANDBY key in the Alarms Configuration Screen.

During spontaneous ventilation, the patient's expiration produces a pressure fluctuation of only a few cmH_2O. To prevent false apnea alarms, touch the ALARM OFF key to disable the breathing pressure apnea (threshold pressure) alarm. During the disable period, the alarm message APNEA-P ALRM OFF appears on the central alarm display.

If a hardware error occurs in breathing pressure monitor, the ALARM ON key is removed from the screen and the ALARM OFF key is highlighted. When the error condition is corrected, the alarms are enabled again.

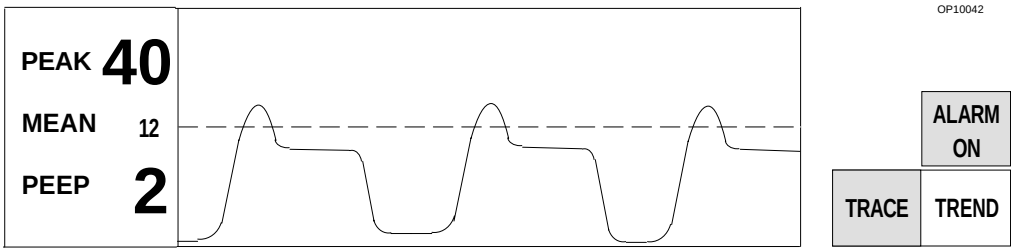
Setting Pressure Alarms On/Off

- To turn the breating pressure alarms on, touch the ALARM ON key.
- To turn the breathing pressure alarms off, touch the ALARM OFF key.

NOTE: The breathing pressure alarms cannot be turned off when the ventilator is on.

Displaying the Waveform (Trace)

To display the breathing pressure waveform, touch the TRACE key. The breathing pressure waveform provides a visual assessment of lung mechanics and ventilation.

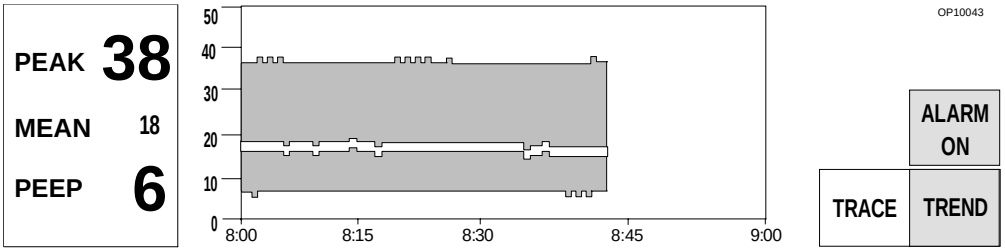


The horizontal dotted line on the waveform represents the threshold pressure (apnea) alarm limit, which is useful to view when adjusting the limit. When the ventilator is off, the trace/trend display shows a moving cursor at the baseline of the display area until the ventilator is turned on.

Displaying the Trend

To display the breathing pressure trend, touch the TREND key. This display provides up to 1 hour of the latest trend information for peak, mean, and PEEP pressure. The trend appears as a shaded area with the peak pressure at the top, the PEEP pressure at the bottom, and the mean pressure a clear line through the shaded area.

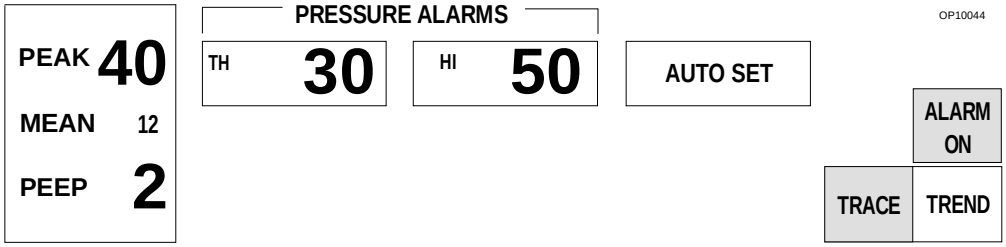
The trend scale at power-up is 0–50 cmH_2O. If the pressure exceeds 50 cmH_2O, the scale will be automatically rescaled to 0–100 cmH_2O.



Section 5 - Operation
Breathing Pressure Monitoring

Using Setup Functions

Alarm limit adjustments and automatic threshold set are done in the Monitor Setup screen. To invoke the Monitor Setup screen, press the MONITOR SETUP key on the main key panel.



Setting Pressure High and Threshold Pressure Alarm Limits

To set the pressure high and the threshold pressure alarm limits:

1. Invoke the Monitor Setup screen.
2. Touch the key for the alarm limit you want to change (TH or HI). That key becomes highlighted.
3. Turn the selection dial to adjust the value within its allowable range (30–120 cmH_2O for the HI limit, 5–30 cmH_2O for the TH limit.)
4. To set the value, press the selection dial or select another function on the screen.

WARNING: The threshold pressure alarm limit should be set as close as possible to the sensed peak pressure without exceeding it.

Automatic Setting of the Threshold Limit

To automatically set the threshold pressure alarm limit:

1. Invoke the Monitor Setup screen.
2. Press the AUTO SET key. The threshold pressure alarm limit is automatically set to 4 cmH_2O below the current peak pressure within the range 5–30 cmH_2O.

NOTE: This function can also be performed from the remote display by highlighting the AUTOSET selection using the Datagrip trigger.

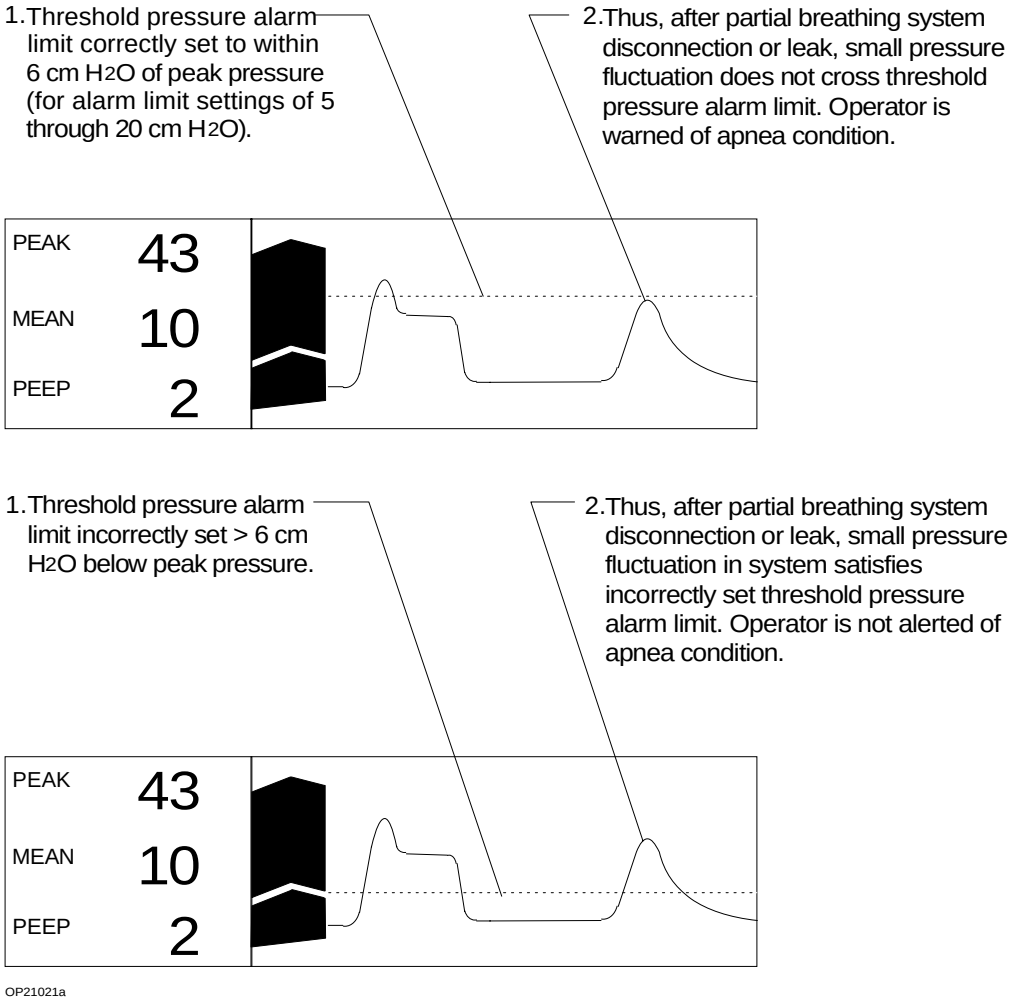
Threshold Limit Guidelines

If a breathing system leak or partial disconnection occurs when the threshold pressure alarm limit is set significantly lower than the peak pressure, continued positive pressure ventilation can produce a pressure fluctuation great enough to exceed the threshold (and thereby satisfy the alarm), yet not great enough to provide adequate ventilation.

To address the problem, the Advisory message THRESHOLD LOW appears on the central alarm display under the following conditions:

- If the sensed peak pressure exceeds the set threshold by more than 6 cmH_2O at threshold pressure alarm limit settings of 5–20 cmH_2O.
- If the sensed peak pressure exceeds the set threshold by more than 8 cmH_2O at threshold pressure alarm limit settings of 21–29 cmH_2O.

The following figure illustrates the effects of correct and incorrect settings of the threshold pressure alarm limit.


1. Threshold pressure alarm limit correctly set to within 6 cm H2O of peak pressure (for alarm limit settings of 5 through 20 cm H2O).
2. Thus, after partial breathing system disconnection or leak, small pressure fluctuation does not cross threshold pressure alarm limit. Operator is warned of apnea condition.
PEAK 43
MEAN 10
PEEP 2
1. Threshold pressure alarm limit incorrectly set > 6 cm H2O below peak pressure.
2. Thus, after partial breathing system disconnection or leak, small pressure fluctuation in system satisfies incorrectly set threshold pressure alarm limit. Operator is not alerted of apnea condition.
PEAK 43
MEAN 10
PEEP 2
OP21021a

Section 5 - Operation
Breathing Pressure Monitoring

Breathing Pressure Alarm Messages

The following list contains all Warning, Caution, and Advisory alarms associated with breathing pressure monitoring.

APNEA-PRESSURE (Warning/Caution)

When the ventilator is on:

If the measured breathing pressure remains below the threshold pressure alarm limit for more than 15 seconds, the Caution message APNEA-PRESSURE appears on the central alarm display and an intermittent audible alarm sounds.

If the breathing pressure remains below the threshold pressure for an additional 15 seconds (30 seconds total), the Caution message APNEA-PRESSURE is upgraded to a Warning on the central alarm display and a continuously repeating audible alarm sounds. During the Warning condition, numeric data remains on the display as long as the monitor detects a peak pressure at least 10 cmH_2O greater than PEEP pressure. When this pressure difference drops and remains below 10 cmH_2O for more than 60 seconds, the numeric data is cleared.

When the ventilator is off:

The Caution condition does not occur until 30 seconds have elapsed; the Warning condition does not occur until 60 seconds have elapsed.

VENT PRESSURE HI (Warning)

If the measured breathing pressure exceeds the high pressure limit, the Warning message VENT PRESSURE HI appears on the central alarm display and a continuously repeating audible alarm sounds.

This alarm condition is cleared when the measured breathing pressure drops below the high pressure alarm limit. However, the alarm message is extended for 5 seconds to allow for a momentary high pressure condition.

SUB ATM PRESSURE (Warning)

If the measured breathing pressure falls below -10 cmH_2O, the Warning message SUB ATM PRESSURE appears on the central alarm display and a continuously repeating audible alarm sounds.

This alarm condition is cleared when the sensed pressure rises above -10 cmH_2O. However, the alarm message is extended for 5 seconds to allow the recognition of a momentary subatmospheric pressure condition.

CONTINUOUS PRES (Warning)	If the measured breathing pressure remains above the threshold pressure alarm limit for more than 15 seconds, the breathing pressure display area is cleared, the Warning message CONTINUOUS PRES appears on the central alarm display and a continuously repeating audible alarm sounds. When the measured breathing pressure drops below the threshold pressure alarm limit, alarm annunciation ceases.
PEEP > 25 (Caution)	Any time that the monitor measures a PEEP of 26 cmH_2O or greater, the Caution message PEEP > 25 appears on the central alarm display and an intermittent audible alarm sounds. Alarm annunciation ceases when the measured PEEP drops below 26 cmH_2O. Also, an APNEA or CONTINUING PRESSURE alarm condition will clear this alarm condition.
THRESHOLD LOW (Advisory)	The Advisory message THRESHOLD LOW appears on the central alarm display any time the sensed peak pressure exceeds the threshold pressure alarm limit by more than 6 cmH_2O at threshold pressure alarm limit settings of 5–20 cmH_2O, or by more than 8 cmH_2O at threshold pressure alarm limit settings of 21–29 cmH_2O. Setting the threshold pressure alarm limit at 30 cmH_2O disables the THRESHOLD LOW advisory.
PEEP > 4 (Advisory)	Any time the monitor measures a PEEP of 5 cmH_2O or greater, the Advisory message PEEP > 4 appears on the central alarm display. When the measured PEEP drops below 5 cmH_2O, the Advisory message is cleared from the display.
APNEA-P ALRM OFF (Advisory)	Any time that the apnea pressure alarm (threshold pressure alarm limit) has been disabled, the Advisory message APNEA-P ALRM OFF appears on the central alarm display.
BR PRES MON ERROR (Advisory)	If the Narkomed 4 detects an internal electronic failure that would prevent proper operation, the Advisory message BR PRES MON ERROR appears on the central alarm display. If this happens, contact a North American Dräger qualified technical service representative.

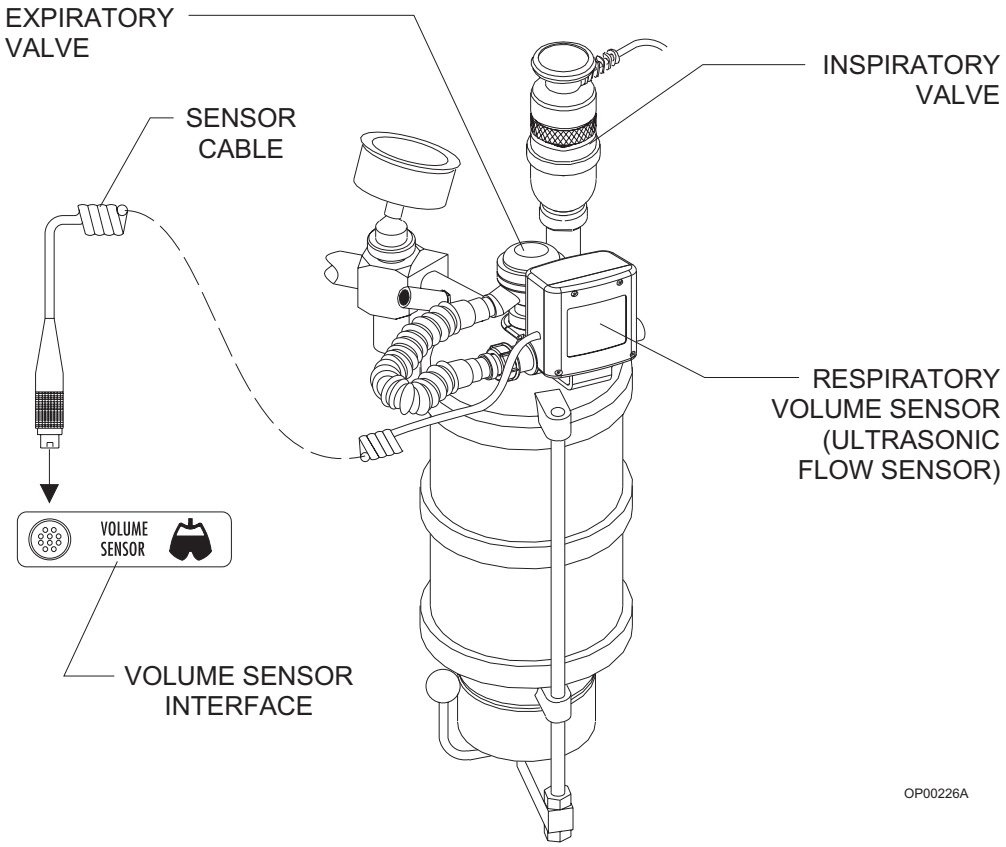
Section 5 - Operation
Breathing Pressure Monitoring

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
No pressure readout in display area during ventilation	Pilot line not connected	Make sure pilot line is properly connected.
	Pilot line blocked or kinked	Make sure that lumen of pilot line is free of obstructions.
Erratic readings	Condensation accumulation in pilot line	Drain and reconnect pilot line.

Overview

Respiratory volume is measured using an ultrasonic flow sensor which is attached to the expiratory valve and mounted to the top of the absorber assembly. The ultrasonic flow sensor has two transducers that measure the time of flight of ultrasonic pulses transmitted upstream and downstream in the respiratory flow path. The difference in time of flight is used to determine the velocity and the flow rate of gas through the patient circuit. The flow sensor output is converted into meaningful readings for minute volume, tidal volume, and respiratory rate displays.



WARNING: The ultrasonic flow sensor can be used with all normal anesthetic gases except oxygen-helium (heliox). Incorrect flow measurements will result if heliox is used.

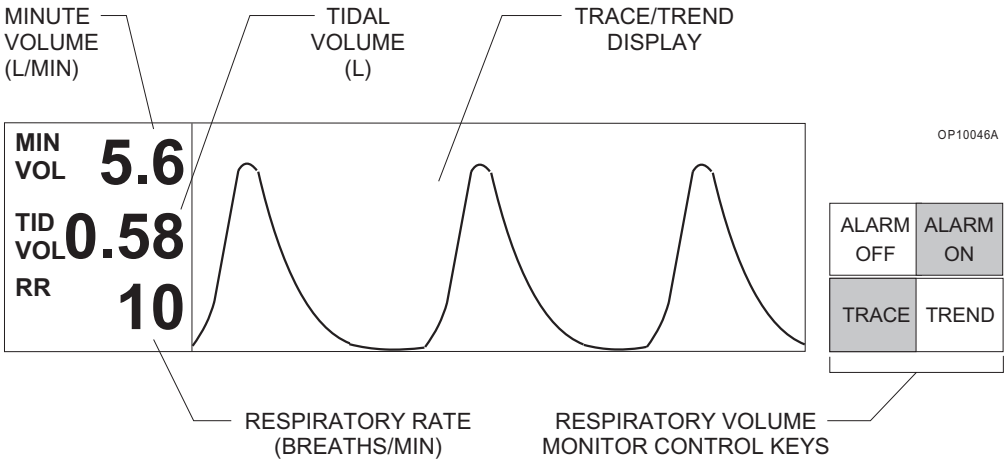
Section 5 - Operation
Respiratory Volume Monitoring

CAUTION: Although the Narkomed 4 is designed to minimize the effects of ambient radio-frequency interference, the functioning of the respiratory volume monitor may be adversely affected by the operation of electrosurgical equipment or short wave or microwave diathermy equipment in the vicinity.

NOTE: Sudden, irregular expiratory flow may cause erratic tidal volume and respiratory rate displays. To avoid such erroneous measurements, defer reading the display until a full minute has elapsed after the irregular flow has stopped.

Monitor Display

The respiratory volume display area, located in the middle part of the right side of the main display, shows numerical and graphical respiratory data.



Numerical values for minute volume, tidal volume, and respiratory rate appear on the left side of the respiratory volume display. These respiratory flow and volume values are displayed if the data is available (i.e. ventilator is on). If the data is not available (i.e. ventilator is off), the values are removed from the screen.

- **Minute Volume (MIN VOL)**—indicates the total volume of exhaled gas accumulated during the previous minute of respiration. It represents a true measurement of the minute volume, not the result of a calculation. If a full one-minute history of exhaled volume is not available, the MIN VOL display area is blank.

- **Tidal Volume (TID VOL)**—indicates the tidal volume for each breath. If no breath has been registered for 30 seconds, the TID VOL display area is blank.

- **Respiratory Rate (RR)**—indicates the total number of breaths registered by the monitor during the previous minute of respiratory activity. If a full minute of respiration has not occurred, the RR display area is blank.

The middle of the respiratory volume display shows the graphical trace or trend. The far right of the display has four keys which allow you to enable/disable alarms and select the trace or trend display. The area above the keys is reserved for displaying up to two alarm messages.

Volume Alarms

To ensure that the volume alarms are active during automatic ventilation, the volume alarms disable function is tied into the ventilator power switch. When you turn the ventilator power switch on, the volume alarms are automatically enabled. However, because some operators use automatic ventilation with a nonrebreathing circuit, the volume alarms can be manually disabled while the ventilator is on by touching the ALARM OFF key. While alarms are disabled, the advisory message VOL ALARMS OFF appears on the central alarm display.

The power-up default with the ventilator off is ALARM STBY (key highlighted), which disables the visual and audible respiratory volume alarms. If the ventilator is turned on, the volume alarms are automatically enabled (the ALARM ON key is highlighted). After the alarms are turned on, they can be set to standby only by touching the ALL STANDBY key in the Alarms Configuration Screen (see “Configuring the Monitoring System” in Section 5, “Operation, Monitoring System” for details).

If a hardware error occurs in the respiratory monitor, the ALARM ON key is removed from the screen and the ALARM OFF key is highlighted. When the error condition is corrected, the alarms are enabled again.

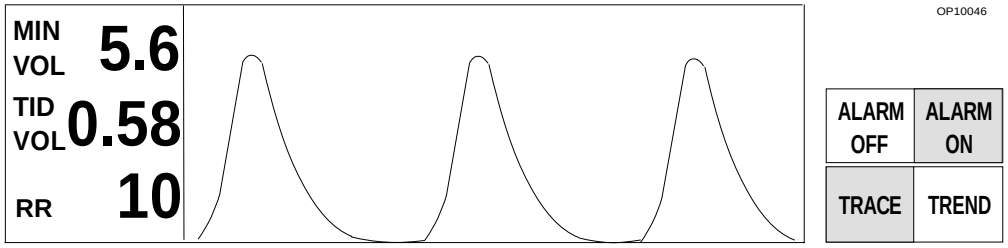
Setting Volume Alarms On/Off

- To turn the volume alarms on, touch the ALARM ON key.
- To turn the volume alarms off, touch the ALARM OFF key.

Displaying the Waveform (Trace)

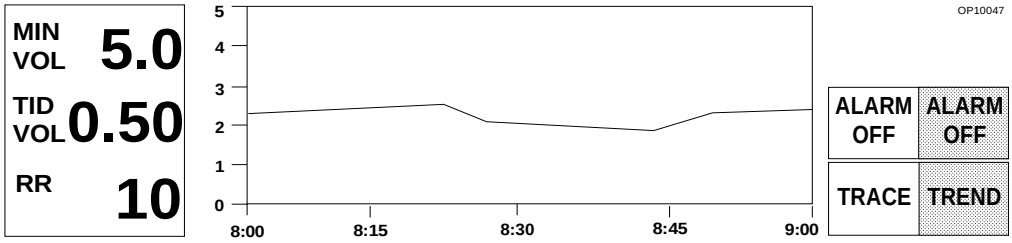
To display the expiratory flow waveform, touch the TRACE key. The expiratory flow waveform provides a means for a quick visual assessment of lung mechanics and ventilation and for checking the expiratory flow pathway.

When the ventilator is off, the trace/trend display area shows a moving cursor at the baseline of the display until the ventilator is turned on.



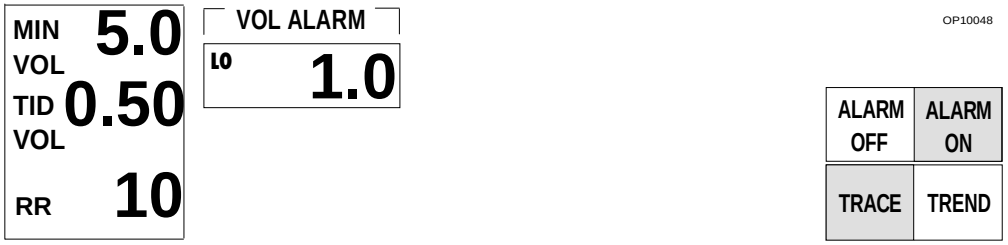
Displaying the Trend

To display the minute volume trend, touch the TREND key. This display provides up to one hour of trend for the minute volume. The trend scale at power-on is 0-5 liters. If the minute volume exceeds 5 liters, the scale is automatically rescaled to 0-10, and then 0-20.



Setting Minute Volume Low Alarm Limit

Alarm limit adjustments are done in the Monitor Setup screen. To invoke the Monitor Setup screen, press the MONITOR SETUP key on the main key panel.



To set the low minute volume alarm limit:

1. Invoke the Monitor Setup screen.
2. Touch the LO alarm limit key. The key will become highlighted.
3. Turn the selection dial to adjust the value within its allowable range (0.5–10 liters).

4. Press the selection dial to enter the new value.

NOTE: The minute volume alarm limit can also be set the Alarms Configuration screen. For further information, see Section 5, "Operation, Monitoring System."

Respiratory Volume Alarm Messages

The following list contains all Warning, Caution, and Advisory alarms associated with respiratory volume monitoring.

APNEA-VOLUME (Warning/ Caution)

The Narkomed 4 continuously monitors the expiratory flow in the patient breathing system. By processing the expiratory flow pattern, the monitor can determine whether a "valid" breath has occurred. A "valid" breath has a tidal volume of 20 ml or greater.

When the ventilator is on:

If 15 seconds pass and a valid breath is not detected, the Caution message APNEA-VOLUME appears on the central alarm display, and an intermittent audible alarm sounds.

If an additional 15 seconds pass (30 seconds total) and a valid breath is not detected, the Caution message APNEA-VOLUME is upgraded to a Warning on the central alarm display, and a continuously repeating audible alarm sounds.

When the ventilator is off:

The Caution condition does not occur until 30 seconds have elapsed. The Warning condition does not occur until 60 seconds have elapsed.

During apneic conditions, the respiratory volume measurements disappear after 30 seconds. When a valid breath is detected, alarm annunciation ceases and a tidal volume measurement appears in the display window. However, a full minute of respiratory activity must be registered before the minute volume and respiratory rate appear.

NOTE: Volume-related alarms can be disabled with the ALARM OFF key.

NOTE: During some breathing system disconnects when the ventilator is in use, the ventilator's dynamics may cause a small volume of gas to be drawn through the expiratory valve and the ultrasonic flow sensor. Because of the enhanced sensitivity of the flow sensor, this volume may be detected as a valid breath. However, the disconnect will still be detected by the airway pressure monitor which is always on and can not be turned off when the ventilator is in use.

MINUTE VOLUME LO (Caution)	Whenever the Narkomed 4 measures a minute volume less than the low minute volume alarm limit, the Caution message MINUTE VOLUME LOW appears on the central alarm display and an intermittent audible alarm sounds.
REVERSE FLOW (Advisory)	If a reverse flow in excess of 20 ml is detected, the Advisory message REVERSE FLOW appears on the central alarm display and a single-tone audible alarm sounds. A forward flow greater than 20 ml clears the alarm condition. The REVERSE FLOW alarm message remains on the screen for 5 seconds after the resumption of forward flow to allow the recognition of an intermittent reverse flow condition.
VOL SENSOR DISC (Advisory)	The VOL SENSOR DISC advisory message appears on the central alarm display if the sensor cable is not properly connected to the interface panel, if there is an internal sensor fault, or if the electronics housing is not properly seated on the flow housing/transducer assembly.
VOL ALARMS OFF (Advisory)	When the volume alarms have been disabled using the ALARM OFF key, the Advisory message VOL ALARMS OFF appears on the central alarm display. This alarm condition may also be generated by sensor cord disconnection.
VOL MON ERROR (Advisory)	If the Narkomed 4 detects an internal electronic failure that would prevent proper operation, the Advisory message VOL MON ERROR appears on the central alarm display. If this happens, contact a North American Dräger qualified technical service representative.

Problem Resolution

PROBLEM	POSSIBLE CAUSE	REMEDY
Blank display area	One full minute has not elapsed (for minute volume and respiratory rate) since respiration began	Wait one full minute to read display.
	Apnea condition	Correct apnea condition. Ensure sensor is properly connected to the expiratory valve.
Blank display area, VOL SENSOR DISC alarm message on central alarm display	Sensor cable disconnected	Reconnect sensor cable to interface panel on anesthesia machine.
	Sensor fault	Replace sensor assembly.
	Electronics housing is not properly seated on flow housing/transducer assembly	Reseat electronics housing on the flow housing/transducer assembly and ensure it is locked in place.
REVERSE FLOW alarm message on central alarm display	Expiratory valve not closing completely during inspiration	Check expiratory valve disc and pins. Clean, repair, or replace expiratory valve.
	Defective sensor	Replace sensor assembly.

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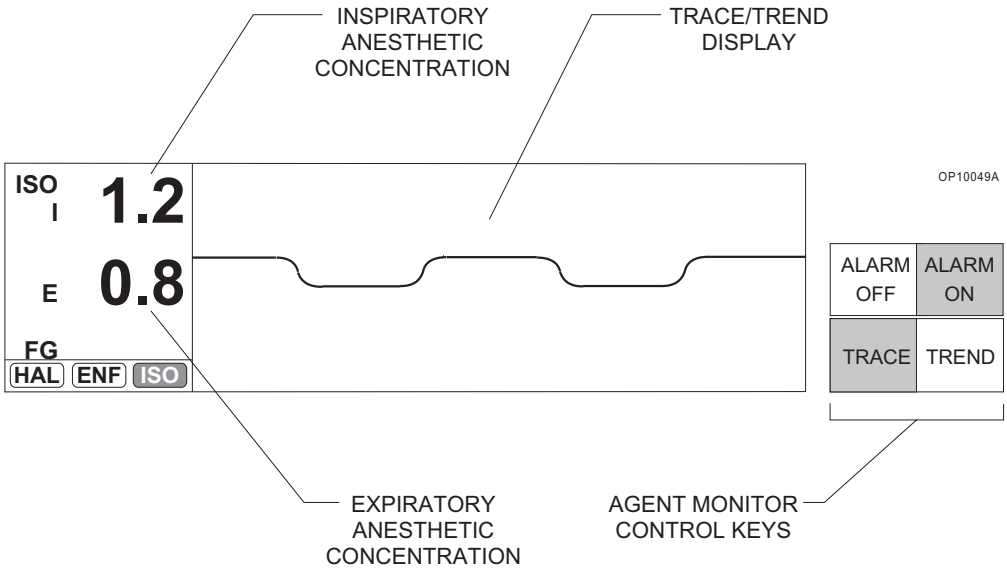
Overview

The Narkomed 4 measures anesthetic agent and nitrous oxide concentrations with a nondispersive infrared analyzer, using a side-stream sample withdrawn at the Y-piece.

Monitor Display

The agent display area, located at the bottom right side of the main display, shows numerical and graphical data for agent concentration.



The left side of the agent display area contains real-time values for the anesthetic concentrations during the inspiratory and expiratory phases. The anesthetic display range is 0–10 % volume for halothane, enflurane, and isoflurane, 0–11 % volume for sevoflurane, and 0–24 % volume for desflurane, with a resolution of 0.1 % volume.

The middle of the agent display shows the graphical trace or trend. The far right of the display has four keys which allow you to enable/disable alarms and select the trace or trend display. The area above the keys is reserved for displaying up to two alarm messages.

NOTE: There is approximately a one-second delay between the patient's respiration and the display of the anesthetic waveforms on the monitoring system's display screen. Expiratory flow and breathing pressure waveforms, however, are displayed simultaneously with the patient's breath. When displaying the anesthetic waveform with either the expiratory flow or breathing pressure waveform, there will be a misalignment on the time scale, even though both waveforms provide information about the same breath.

NOTE: When the sample line is connected to the fresh gas outlet, the message FRESH GAS CIRCUIT IS ENABLED appears in the trace area of the display.

Agent Alarms

There is a delay (approximately 8 minutes while the gas analyzer is in the reduced accuracy mode) after the Narkomed 4 is initially powered-on during which agent data and waveform are not displayed. During this period the ALARM ON key does not appear on the screen, and the ALARM OFF key is highlighted. Provided an agent has been selected, when the initial delay period is over, agent data and waveform appear on the display along with the ALARM ON key, and the ALARM OFF/STBY key is set to ALARM STBY.

As soon as agent is detected, the ALARM ON key is enabled (highlighted) and the ALARM STBY key is changed to ALARM OFF. After the alarms are turned on, they can be set to standby only by touching the ALL STANDBY key in the Alarms Configuration Screen (see “Configuring the Monitoring System” in Section 5, “Operation, Monitoring System” for details).

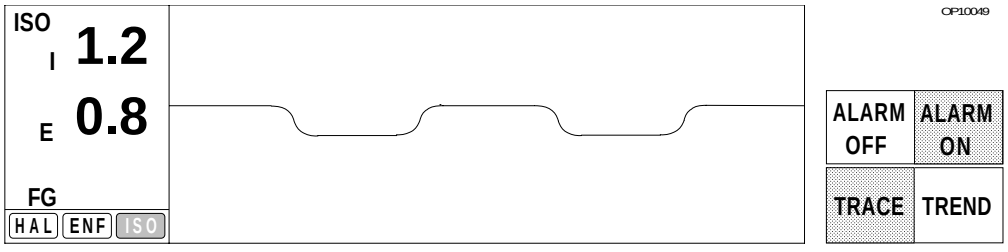
If a carbon dioxide/agent error is encountered, the ALARM ON key and the agent waveform disappear from the display. The ALARM ON key also disappears from the display every time an agent calibration is performed.

Setting Agent Alarms On/Off

- To turn the agent alarms on, touch the ALARM ON key.
- To turn the agent alarms off, touch the ALARM OFF key.

Displaying the Waveform (Trace)

To display the agent waveform, touch the TRACE key. The agent waveform provides an indication of the patient’s uptake of agent and depth of anesthesia.

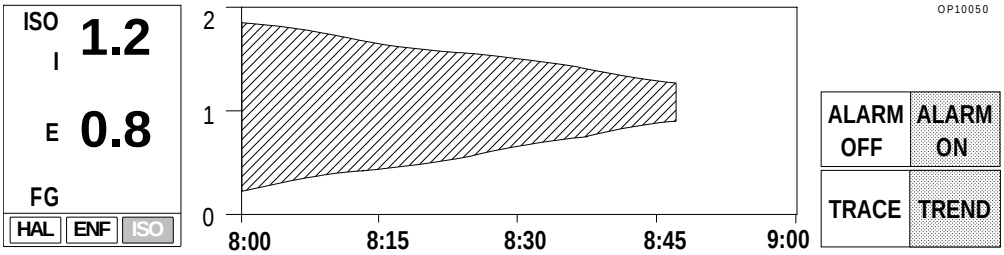


When no agent trace data is available, the agent trace/trend display shows a moving cursor at the baseline of the display area. During agent calibrations, the message AGT CALIBRATION IN PROGRESS appears in the trace/trend display area.

The shape of agent waveforms during the induction-maintenance phase of a case differs from that generated in the recovery phase. During the induction-maintenance phase, the waveform's inspiratory concentration is greater than the expiratory concentration. During the recovery phase, the waveform's expiratory concentration is greater than the inspiratory concentration.

Displaying the Trend

To display a one hour trend, touch the TREND key. The trend appears as shaded area between the inspiratory and expiratory data values.



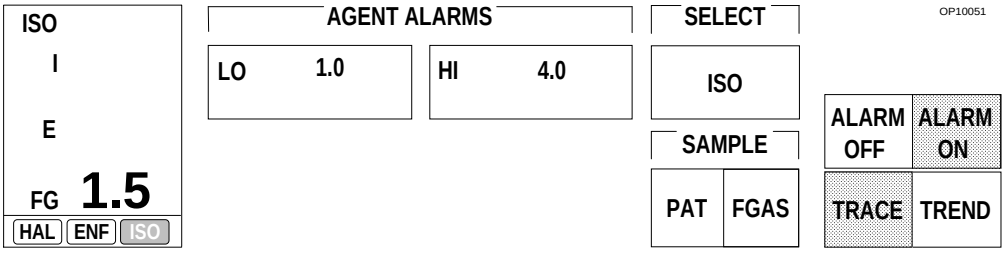
The trend scale at power-up is 0–2%. If the agent exceeds 2%, the scale is automatically rescaled to 0–5%, then to 0–10%, and then to 0–20%.

Using Setup Functions

Use the Monitor Setup screen to perform the following functions:

- set the high and low agent alarm limits
- select the anesthetic agent to be measured
- select the sample line

To invoke the Monitor Setup screen, press the MONITOR SETUP key on the main key panel.



Setting Agent Alarm Limits

To set agent alarm limits:

1. Invoke the Monitor Setup screen.
2. Touch the key for the alarm limit you want to change (LO or HI). That key becomes highlighted.
3. Turn the selection dial to adjust the value within its allowable range (0.0–23.9% for the LO limit, 0.1–24.0% for the HI limit).
4. To set the value, press the selection dial or select another function on the screen.

Selecting the Agent

The Narkomed 4 automatically selects the agent (halothane, enflurane, isoflurane, sevoflurane, or desflurane) for analysis when the corresponding vaporizer is activated. The vaporizer configuration order is displayed at the bottom of the numeric window, designated as HAL, ENF, ISO, SEV, or DES. If one of the positions is not configured for a vaporizer, dashes (---) appear in the display area. When the vaporizer is selected, its designation is highlighted and its three letter designation appears in the upper portion of the numeric display. In addition, an indicator light directly above the activated vaporizer comes on.

If no vaporizer is activated on the anesthesia system, you can select the agent manually as follows:

1. Invoke the Monitor Setup screen.
2. Touch the SELECT key.
3. Turn the selection dial to select the agent.
4. To set the value, press the selection dial or select another function on the screen.

If no agent is selected for analysis, alarms are disabled and the advisory message AGENT NOT SELECT appears on the central alarm display.

NOTE: An activated vaporizer takes priority over any agent selected through the Monitor Setup screen.

Selecting the Sample Line

The sample line selection allows you to switch the sampled gas between the patient line and the fresh gas outlet. To select the sample line:

1. Invoke the Monitor Setup screen.
2. Touch the key for the sample line you want:

- Touch PAT to sample gas through the patient sample line. The trace/trend area will display real-time agent data.

- Touch FGAS to enable the fresh gas circuit. The message FRESHGAS CIRCUIT IS ENABLED appears in the carbon dioxide and agent trace/trend windows.

Agent Monitoring Alarm Messages

The following list contains all Warning, Caution, and Advisory alarms associated with agent monitoring.

% HALOTHANE HIGH, % ENFLURANE HIGH, % ISOFLURANE HIGH, % SEVOFLURANE HIGH, % DESFLURANE HIGH (Warning)

If the measured anesthetic concentration exceeds the preset high anesthetic alarm limit, the Warning message % HALOTHANE HIGH, % ENFLURANE HIGH, % ISOFLURANE HIGH, % SEVOFLURANE HIGH, or % DESFLURANE HIGH appears on the central alarm display and a continuously repeating audible alarm sounds.

% HALOTHANE LOW, % ENFLURANE LOW, % ISOFLURANE LOW, % SEVOFLURANE LOW, % DESFLURANE LOW (Caution)

If the measured anesthetic concentration is below the preset low anesthetic alarm limit, the Caution message % HALOTHANE LOW, % ENFLURANE LOW, % ISOFLURANE LOW, % SEVOFLURANE LOW, or % DESFLURANE LOW appears on the central alarm display and an intermittent audible alarm sounds.

AGENT DETECTED (Caution)

If the agent monitor detects the presence of an anesthetic (greater than 0.5 volume %) but no agent has been selected for analysis, the Caution message AGENT DETECTED appears on the central alarm display and an intermittent audible alarm sounds.

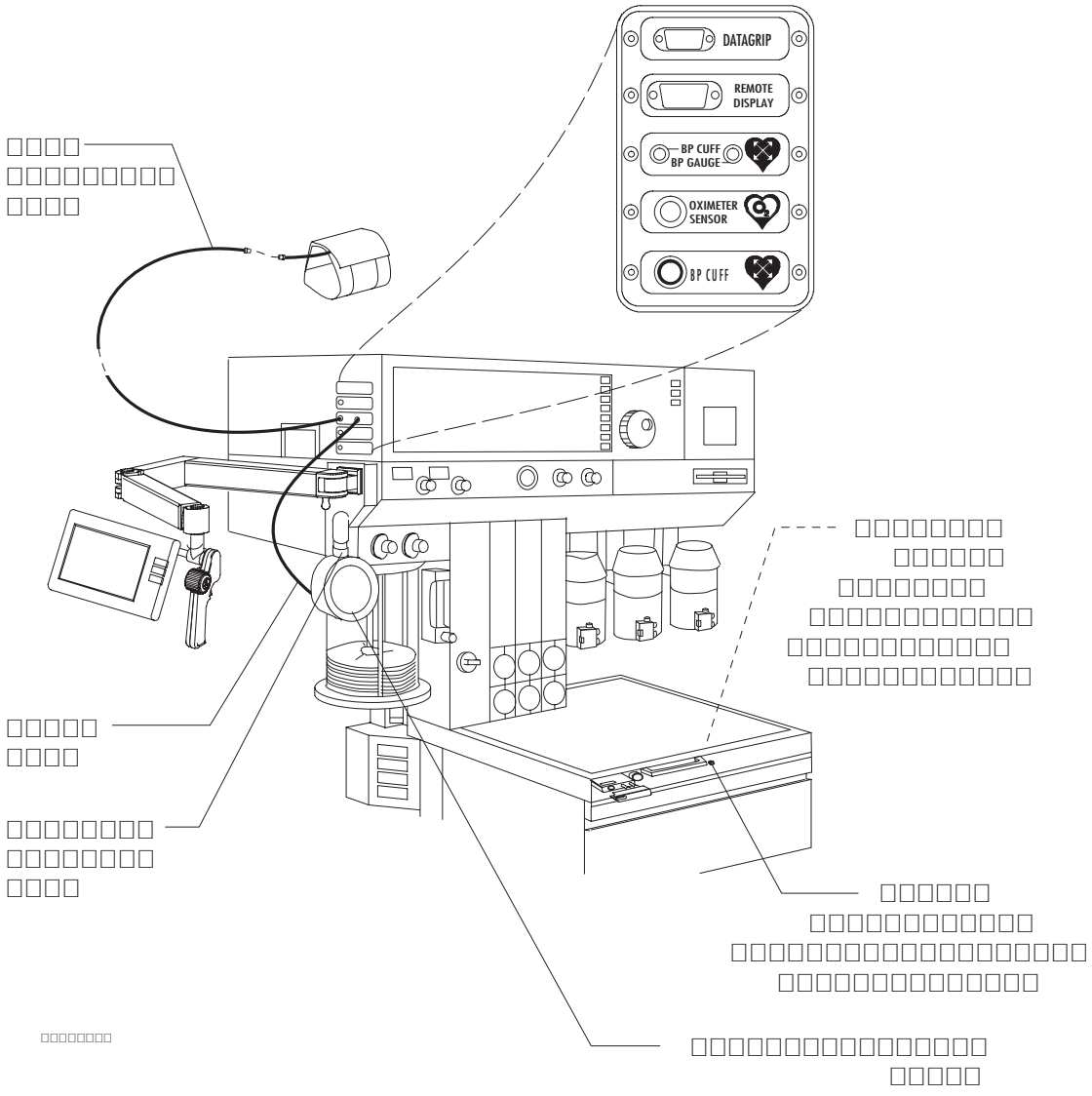
MULTI VAP SEL (Caution)

If more than one agent has been selected, the Caution message MULTI VAP SEL appears on the central alarm display and an intermittent audible alarm sounds. This indicates a problem with the vapor exclusion system. Correct the problem by ensuring that only one agent is selected and contact a qualified North American Dräger technical service representative.

AGENT NOT SELECT (Advisory)	Since the agent monitor cannot identify the agent being measured, the agent to be analyzed must be selected (see “Selecting the Agent” earlier in this section) before anesthetic concentrations can be measured. Otherwise, the Advisory AGENT NOT SELECT appears on the central alarm display.
ANALYZER WARMUP (Advisory)	While the agent monitor is in its warm-up period, the Advisory message ANALYZER WARMUP appears on the central alarm display. After the agent analyzer warms up and enters its full accuracy mode, the Advisory message is cleared. Although agent monitoring can be used during the warm-up period, the measurements obtained during this period may not be as accurate as those obtained in the full accuracy mode, and zero calibrations occur more frequently.
AGENT ALARMS OFF (Advisory)	Any time that the agent alarms are disabled, the Advisory message AGENT ALARMS OFF appears on the central alarm display. This occurs automatically during the automatic 3-minute disable period and during calibration. The alarms may also be disabled by touching the ALARM OFF key.
VAP NOT CONFIG (Advisory)	If a vaporizer has not been configured for the position selected, the Advisory message VAP NOT CONFIG appears on the central alarm display and a single tone audible alarm sounds. Contact a qualified North American Dräger technical service representative.
CO2/AGENT ERROR (Advisory)	If the monitor detects an internal electronics failure that would preclude proper carbon dioxide and agent monitoring, the Advisory CO2/AGENT ERROR appears on the central alarm display, and the carbon dioxide and agent monitoring display areas are cleared. The machine should be serviced as soon as possible.

Overview

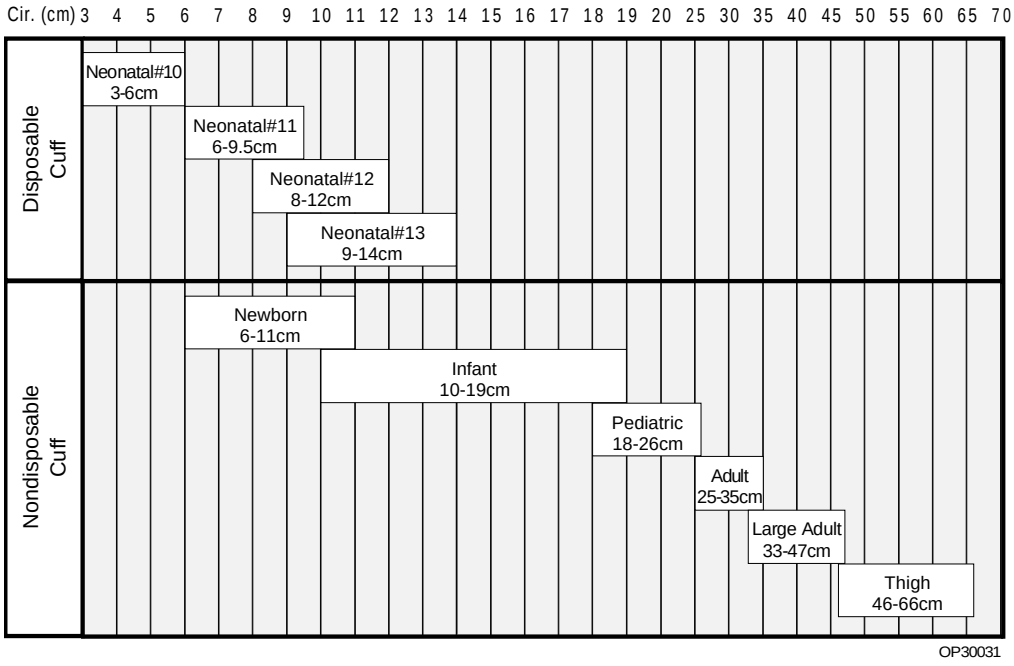
An aneroid manual sphygmomanometer can be mounted on the Narkomed 4. The sphygmomanometer gauge is positioned on the left side of the anesthesia machine, next to the ventilator bellows. The cuff inflation bulb is located to the right of the oxygen flush button on the front of the machine.



Section 5 - Operation
Manual Sphygmomanometer

Selecting a Blood Pressure Cuff

When preparing for a case that includes noninvasive blood pressure monitoring, be sure to choose the correct cuff size and to place the cuff correctly. Use the following table to select the appropriate cuff size. If you don't have a tape measure, use the INDEX and RANGE lines marked on the cuff as described in *Placing the Cuff*, below.


Cir. (cm) 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 25 30 35 40 45 50 55 60 65 70
Disposable Cuff
Neonatal#10 3-6cm
Neonatal#11 6-9.5cm
Neonatal#12 8-12cm
Neonatal#13 9-14cm
Nondisposable Cuff
Newborn 6-11cm
Infant 10-19cm
Pediatric 18-26cm
Adult 25-35cm
Large Adult 33-47cm
Thigh 46-66cm
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Connecting the Cuff

To connect the cuff:

1. Connect the cuff hose (attached to the cuff) to the Luer lock fitting on one end of the extension hose.

2. Connect the threaded fitting on the other end of the extension hose to the fitting on the patient interface panel labeled BP CUFF.

3. Make sure that the hoses are not pinched or kinked.

After connecting the manual sphygmomanometer, check the gauge's pressure indication. With zero pressure applied to the gauge and cuff, the gauge pointer should remain within the band marked on the face plate.

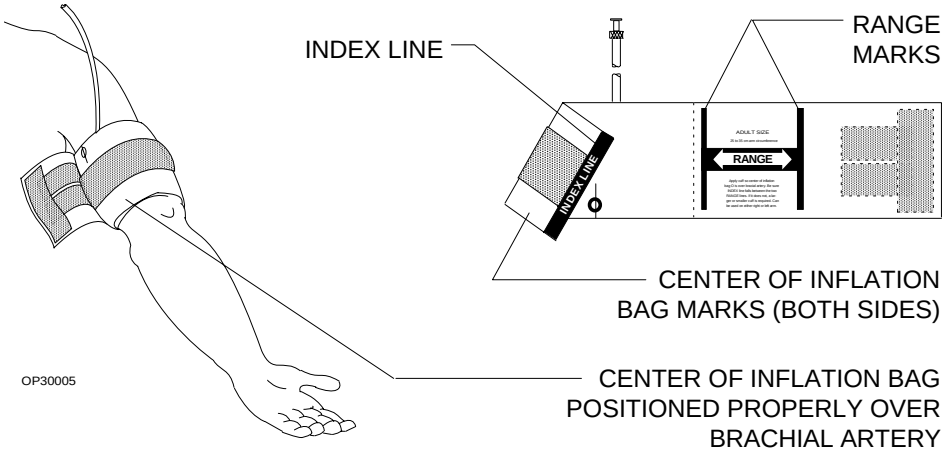
Placing the Cuff

To apply the pressure cuff:

1. Place the center of the cuff inflation bag over the artery (for the brachial artery, place the bag on the inside of arm, above the elbow).

2. Make sure the cuff fits securely on the limb and that the INDEX line falls between the two RANGE lines. If the INDEX line does not fall between the RANGE lines, select a smaller or larger cuff. The cuff can be used on either a left or right extremity, but the left is preferred.

   NOTE: Do not place the cuff on a limb being used for infusion.



The cuff should be positioned at the same level as the patient's heart for an accurate measurement. Placing the cuff above the heart causes the reading to be falsely low; placing the cuff below the heart causes the reading to be falsely high. In instances when you cannot place the cuff at the same level as the heart, use the following general rule:

- For every inch above the heart, add 1.8 mmHg to the reading.
- For every inch below the heart, subtract 1.8 mmHg from the reading.

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Overview

The O.R. Data Manager is an electronic data management information storage/retrieval system. It creates an electronic patient record from the information automatically recorded by the monitoring system, and from information that is entered through the keyboard and the Datagrip, such as patient/case data, events, drugs and other case-related information. A record of the information may be printed using the optional printer.

The O.R. Data Manager consists of a central processor unit with an integral floppy disk drive, a keyboard with function keys for data entry and editing, and a remote display with Datagrip shared with the Narkomed 4 for conveniently viewing the information. The O.R. Data Manager enhances the Narkomed 4 by providing it with a means of recording patient information, drug administration, events and other case-related information.

Floppy Disk or Network System

The O.R. Data Manager can be configured to record information to a floppy disk or to a network drive disk. A network disk can store multiple cases, whereas a floppy disk can store only one case. Both floppy disks and network disks can store multiple drug and event templates for convenient future retrieval. The O.R. Data Manager must be configured as either a floppy disk or a network-based system by a North American Dräger qualified technical service representative.

An O.R. Data Manager configured for a network senses whether the network is up or down at the start of a case and switches to a floppy system if the network is down. Likewise, if the network connection is lost during a case, the O.R. Data Manager reverts to a floppy system automatically.

Information That Can Be Recorded and Viewed

The O.R. Data Manager allows you to enter, edit and view such information as

- patient/case information
- drug administration by name, amount and time
- events that occur during the case
- graphical displays and numerical information based on data received from the monitoring system
- CO_2 waveform and gas analysis
- graphical history of the recorded information

This information is automatically stored electronically on a floppy disk or on a network disk, providing a means of accessing the information later. All data is recorded in a format compatible with North American Dräger's offline software programs PC Prep/View, Import/Query™, Drug Utilization™, O.R. Utilization™ and Quality Assurance™.

Central Processing Unit with Floppy Disk Drive and Network Interface

The central processing unit (CPU) for the O.R. Data Manager is mounted inside the ventilator box. It is a small, self-contained computer that processes data received from the anesthesia machine and data entered through the keyboard and the Datagrip.

Accessible from the front, is a 3.5" (1.44 megabyte) floppy disk drive. If the O.R. Data Manager is configured for a floppy disk, data is automatically written to the floppy disk inserted in this drive. If the O.R. Data Manager is configured for a network, data is automatically written to the network disk. If the network is down, however, the O.R. Data Manager will automatically revert to the floppy disk.

The light on the front of the disk drive comes on whenever the drive is reading or writing information.

CAUTION: To avoid losing data, never remove the floppy disk from the O.R. Data Manager when the disk drive light is on or while an anesthesia record is being printed.

The O.R. Data Manager subassembly also includes a hard drive. This drive is used by the O.R. Data Manager for storing its programs, site lists, and other data that needs to be retained from case to case. The hard drive also provides redundant storage for cases; all cases recorded on the O. R. Data Manager are saved to the hard drive as well as to the floppy or network, and the last hundred cases are always present on the hard drive. Cases can be accessed from the hard drive by using the O.R. Data Manager Transfer Case function.

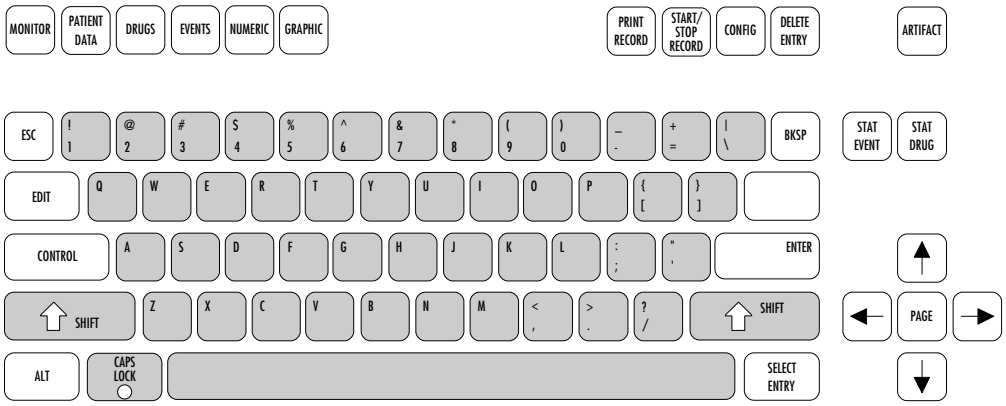
Keyboard

The keyboard is an integral part of the Narkomed 4 anesthesia system. Use the keyboard to enter and edit patient data, drug, flows, fluids and event information into the patient record, or to switch between the Narkomed 4 monitor display and any of the various O.R. Data Manager screens for viewing on the remote display.

Standard Keys

The alphanumeric keys on the keyboard are used for data entry.

The SHIFT keys switches the letter keys and symbol keys from lower case to upper case mode. The CAPS LOCK key locks the A through Z keys in the upper case mode. It cannot, however, be used to type the symbols that appear on the upper portion of the key. A light on the CAPS LOCK key will come on when it is locked in position. Press the key a second time to release the function; the light will go out.



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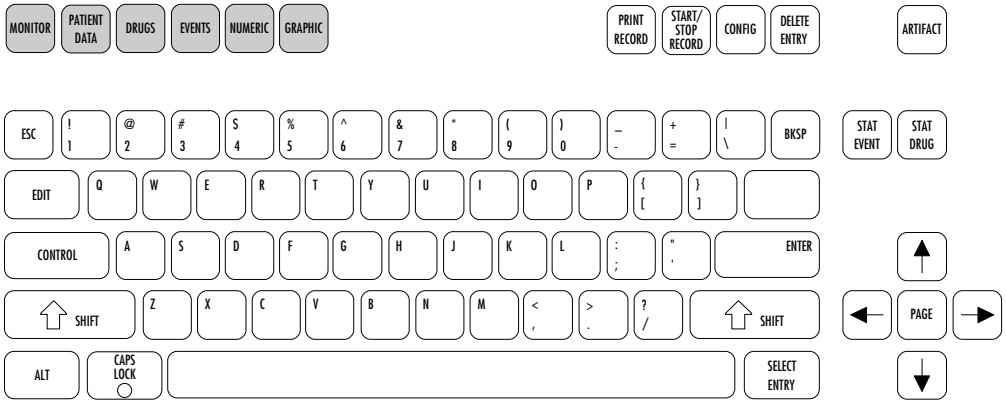
Screen Keys

The keys on the upper left of the keyboard invoke display screens which are used to view and enter various aspects of the patient record.



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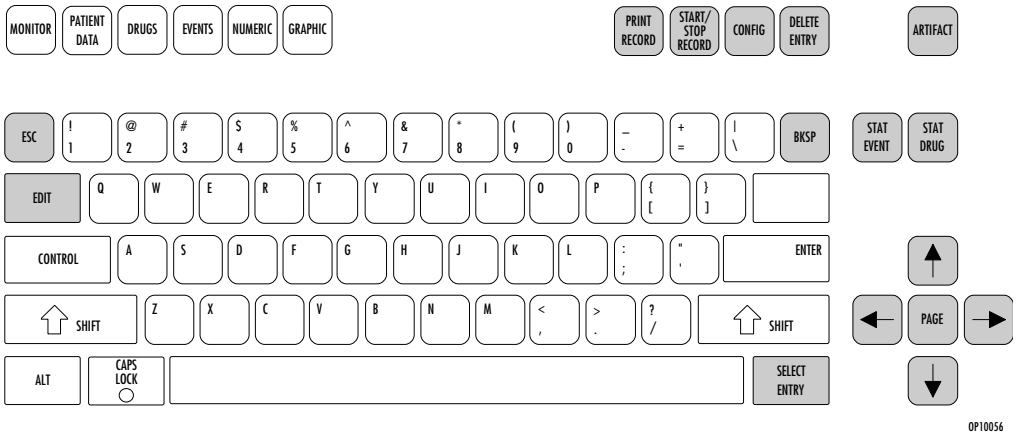
Section 5 - Operation
O.R. Data Manager

Function Keys

The keys at the right side of the keyboard perform specific O.R. Data Manager functions. Some of these keys perform slightly different functions depending on the screen in which they are used. Where applicable, the function keys are discussed in detail throughout this section.



Remote Display

The remote display is the focal point for observing all information. Graphical and numeric data, events that have been entered, drugs administered, CO_2 waveform, and alarms appear on the O.R. Data Manager remote display. The remote display is mounted to an adjustable display arm so that it can be positioned in the vicinity of the patient.

Datagrip

The Datagrip is a user input device attached to the side of the remote display. It is composed of a trigger and a thumbwheel and can be tilted up or down for convenience and comfort.

Rotating the Datagrip thumbwheel allows you to move the cursor around in screens and to scroll through menus. Pressing the Datagrip trigger allows you to invoke screens, enter data, and select options from menus.

Screens

The following screens can be invoked by pressing the corresponding key on the keyboard or by selecting them from a screen menu using the Datagrip:

- Narkomed 4 Monitor (MONITOR)
- Patient Data (PATIENT DATA)
- Pre-Anesthesia Evaluation
- Drug Administration (DRUGS)
- O.R. Event Record (EVENTS)

- Numeric Data (NUMERIC)
- Graphic History (GRAPHIC)
- QA Indicators
- Print Record (PRINT RECORD)
- System Configuration (CONFIG)

Handling Floppy Disks

Floppy disks are a durable and reliable means of electronic data storage. However, certain precautions must be taken to ensure that the disk is not damaged or the data corrupted during use or storage.

- Always keep disks away from dust and dirt. Small particles of dust or dirt may scratch the magnetic surface and destroy data.
- Always keep disks away from magnetic fields.
- Always store disks in a moderate environment (such as normal room temperature and humidity).
- Never touch the disk's magnetic surface.
- Always store disks in a diskette container when not in use.
- Never wipe, brush or try to clean the magnetic surface in any way.
- Be sure to label all disks for proper identification.
- Do not use an eraser on a label affixed to a disk.
- Remove the disk before unplugging the O.R. Data Manager.

Preparing the Floppy Disk for Use

A separate disk must be used for each patient case file. Insert a preformatted disk into the disk drive at the beginning of the case.

All disks must be formatted before they can be used. Disks purchased from North American Dräger have been preformatted.

NOTE: If the disk is not formatted, it may be formatted in any PC/MS-DOS compatible computer with a 3.5 inch, 1.44 megabyte disk drive. Refer to your computer's PC/MS-DOS manual for instructions on how to format a disk.

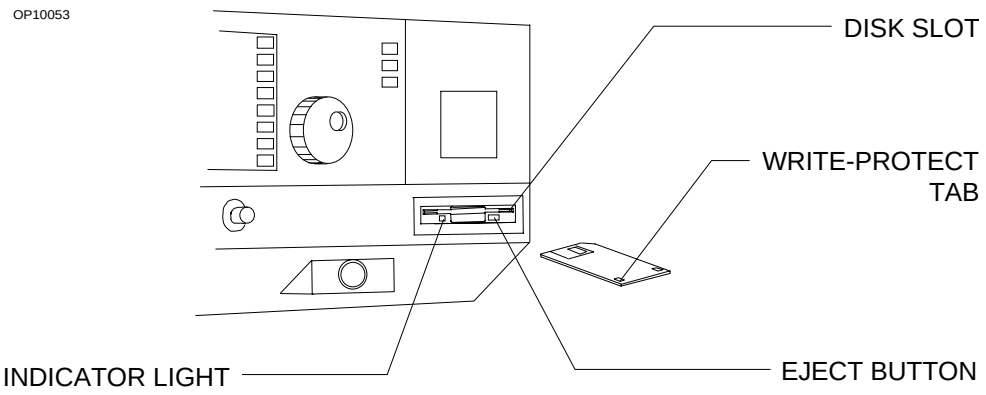
Inserting/ Removing the Disk Into the Floppy Drive

To insert the floppy disk into the disk drive:

1) Make sure the disk drive is empty by pressing the eject button on the disk drive .

2) Hold the disk so that the metal media cover is facing toward the disk slot and the round metal hub is facing toward the eject button and indicator light.

3) Insert the disk into the drive and make sure it locks into place.



To remove the floppy disk from the disk drive:

1) Press the eject button on the drive. The floppy disk will partially self-eject from the drive.

2) Take the floppy disk out of the drive.

NOTE: To make sure that the data on the disk in not overwritten, place the write-protect shutter to the protect position (window is **open**).

General Operation

The following subsections provide general operating instructions for the O.R. Data Manager and also explain operations that are common to most of the display screens. For specific information on a particular screen, refer to that screen's instructions.

Selecting a Screen

To select a screen for entering or viewing information, press one of the Screen keys along the top of the keyboard:

MONITOR — Invokes the Monitor screen

PATIENT DATA — Invokes the Patient Data screen

DRUGS — Invokes the Drug Administration screen

EVENTS — Invokes the O.R. Event Record screen

NUMERIC — Invokes the Numeric Data screen

GRAPHIC — Invokes the Graphic History screen

PRINT RECORD — Invokes the Print Record screen

CONFIG — Invokes the System Configuration menu screen.

The QA INDICATORS screen is invoked by pressing ALT - Q.

The PRE-ANESTHESIA EVALUATION screen is invoked by pressing ALT - E.

You can also select a screen by using the Datagrip to invoke the O.R. Data Manager Screen Menu (described later). You can invoke the screen menu in the Monitor screen by pressing the Datagrip trigger. For information on how to invoke the screen menu from the O.R. Data Manager screens, see the specific operating instructions for each screen.

Moving the Cursor

You can move the cursor (shown as a highlighted or reverse-color box) to any cell on the screen that accepts information from the keyboard.

- Press the arrow keys (→, ←, ↑, and ↓) to move the cursor from cell to cell.
- You can also move the cursor by turning the Datagrip thumbwheel. In the Drug Administration, O.R. Event Record, QA Indicators and Numeric Data screens, the direction of cursor movement is defined by a direction indicator displayed on the screen. The ↔ indicator means you can move the cursor left and right, while the ↕ indicator means you can move the cursor up and down. To switch between horizontal and vertical movement, position the cursor on the direction indicator, and press the Datagrip trigger. When in the vertical movement mode (↕), the entire line is highlighted for readability.
- When there are multiple screens of data, hold down the PAGE key and press the →, ←, ↑, and ↓ keys to see information on previous or subsequent screens.

Entering Data

To enter data into O.R. Data Manager, you must first select a screen. Data can be entered in the Patient Data, Drug Administration, QA Indicators, O.R. Event, Numeric, and System Configuration screens. To enter information in a cell, move the cursor to the desired cell using the arrow keys or the Datagrip thumbwheel; then enter the data using the alphanumeric keys, the Datagrip trigger, or the SELECT ENTRY key. (For more information on the use of the Datagrip trigger or the SELECT ENTRY key, refer to the operating instructions for each screen.)

When viewing any screen, you can press the ARTIFACT key to make a *note* on the O.R. Event and Graphic History screens to indicate that an invalid reading occurred. This action reserves an entry on the O.R. Event screen at the time you pressed the key, and automatically enters ARTIFACT in the name column. Later, you can edit the O.R. Event screen to describe what occurred and adjust the time. On the Graphic History screen, the letter A appears at the time of the occurrence.

Similarly, you can press the STAT DRUG key at any time to make a *note* on the Drug Administration screen that a drug was administered at that time. This action reserves an entry on the Drug Administration screen at the time the you pressed the key, and automatically enters STAT DRUG in the name column. You can edit the Drug Administration screen later to enter the actual drug name and dose.

Likewise, you can press the STAT EVENT key at any time to make a *note* on the O.R. Event screen to indicate that an event took place. This reserves an entry on the O.R. Event screen at the time you pressed the key, and automatically enters STAT EVENT in the name column. You can edit the O.R. Event screen later to describe the event.

Editing Data

You can edit any screen that can receive information from the keyboard.

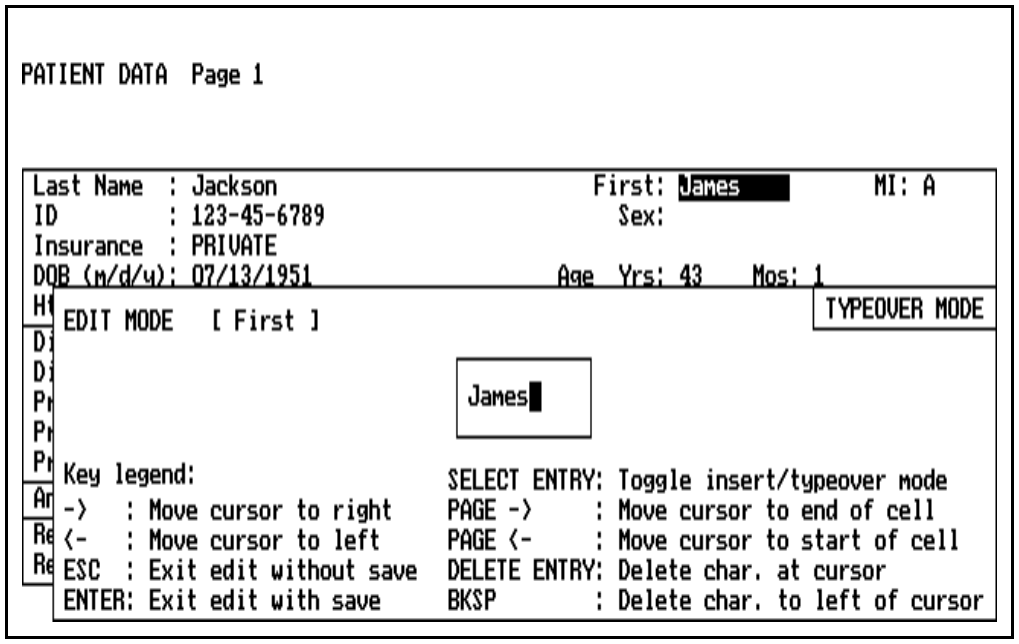
- Use the BKSP key to delete the last character typed.
- If you have not pressed the ENTER key, you can press the ESC key to clear newly entered data from a cell and restore the previous entry, if any.
- To complete an entry and advance the cursor to the next cell, type the desired data and press the ENTER key or the →, ←, ↑ or ↓ keys.

Section 5 - Operation
O.R. Data Manager

Edit Mode

The O.R. Data Manager has an edit mode that allows you to edit characters in a selected cell. The edit mode can be invoked in the following screens: Patient Data, Drug Administration, O.R. Event Record, Numeric, and Configuration Options.

To invoke the edit mode, highlight a cell you want to edit using the →, ←, ↑ or ↓ keys or the Datagrip thumbwheel, and press the EDIT key. The Edit Mode window will appear. (Patient Data screen illustrated)



The Edit Mode window displays the selected cell along with editing instructions.

- Use the ← and → keys to position the cursor at the character you want to change.
- Hold down the PAGE key and press the ← or → keys to position the cursor at the beginning or end of the line.
- Use the DELETE ENTRY or BKSP keys to delete characters.
- Use the SELECT ENTRY key to toggle between INSERT and TYPEOVER modes.

Press the ENTER key to save your changes and exit Edit Mode. Press the ESC key to exit Edit Mode without saving the changes.

Pop-up Menus

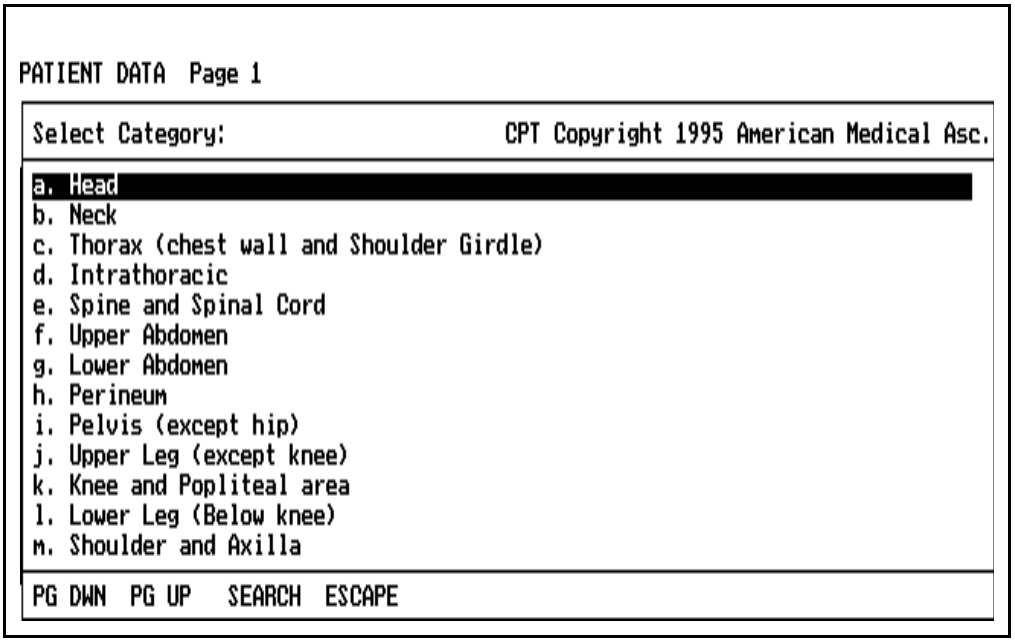
Pop-up menus appear in response to pressing the SELECT ENTRY key to provide a list of choices for entries in the Patient Data, Drug Administration, O.R. Event Record, Numeric Data, QA Indicators, and System Configuration screens (described later).

All of the pop-up menus will time out after 45 seconds has elapsed without a keystroke. No data is entered on a timeout.

Pop-up menus have two possible display formats: Single Entry and Pick List. In the Single Entry format, only one item can be selected from a displayed list. In the Pick List format, multiple items can be selected.

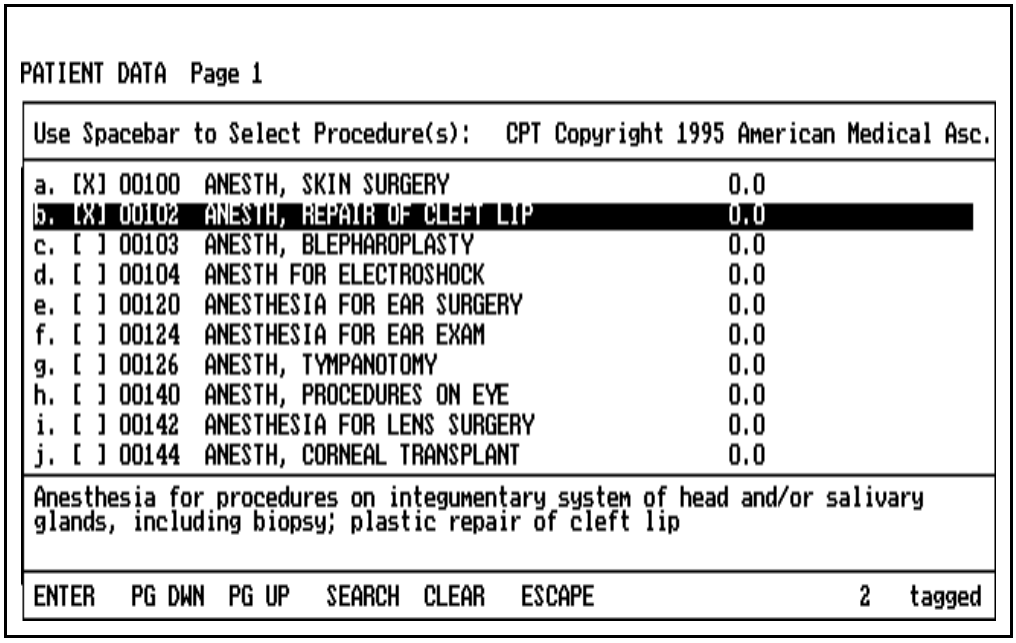
A menu selection mode option allows you to set the desired display format for the pop-up menus (refer to the subsections beginning with **System Configuration Screen**). If Single Entry is chosen, all pop-up menus will appear in the Single Entry format.

Single Entry Format



Pick List Format

If Pick List is chosen, pop-up menus for items which may have multiple selections will appear in the Pick List format. Items which allow multiple selections include procedure descriptions/codes and staff names on the Patient Data screen, drug names on the Drug Administration screen, event descriptions on the O.R. Event Record screen, and numeric item names on the Numeric Data screen. All pop-up menus for items which can only ever have one choice (e.g. anesthesia type, current drug template name) will appear in single entry format even if the pick list option is chosen. The pop-up menus in this manual are shown in the format in which they appear when pick list mode is chosen.


PATIENT DATA Page 1
Use Spacebar to Select Procedure(s): CPT Copyright 1995 American Medical Asc.
a. [X] 00100 ANESTH, SKIN SURGERY 0.0
b. [X] 00102 ANESTH, REPAIR OF CLEFT LIP 0.0
c. [ ] 00103 ANESTH, BLEPHAROPLASTY 0.0
d. [ ] 00104 ANESTH FOR ELECTROSHOCK 0.0
e. [ ] 00120 ANESTHESIA FOR EAR SURGERY 0.0
f. [ ] 00124 ANESTHESIA FOR EAR EXAM 0.0
g. [ ] 00126 ANESTH, TYMPANOTOMY 0.0
h. [ ] 00140 ANESTH, PROCEDURES ON EYE 0.0
i. [ ] 00142 ANESTHESIA FOR LENS SURGERY 0.0
j. [ ] 00144 ANESTH, CORNEAL TRANSPLANT 0.0
Anesthesia for procedures on integumentary system of head and/or salivary glands, including biopsy; plastic repair of cleft lip
ENTER PG DWN PG UP SEARCH CLEAR ESCAPE 2 tagged

Single Entry format is the default mode.

Menu Buttons

Buttons are displayed at the bottom of each pop-up menu. Only the relevant buttons are displayed; for example, PG UP and PG DWN do not appear on a single screen menu. To select a menu button, move the cursor to it with the arrow keys or the Datagrip thumbwheel, and press the ENTER key, the SELECT ENTRY key or the Datagrip trigger.

The buttons and their functions are:

ENTER returns all selected entries to the main screen. This button is active only in the Pick List format. The ENTER key also performs this function.

PG DWN moves down one page in the list. This button is only active for multi-screen lists. The PAGE+↓ key combination also performs this function.

PG UP moves up one page in the list. This button is only active for multi-screen lists. The PAGE+↑ key combination also performs this function.

SEARCH enters the search mode. This is an interactive search that moves through the list in response to what the user types. For example, if the user types "p", the cursor moves to the first item in the list beginning with "p"; if the user types "pan", the cursor moves to the first item beginning with "pan", etc. The backspace key is active; case and leading spaces are ignored. Exit the search mode by pressing the ENTER key, the ESC key, any arrow key, PAGE+↑, PAGE+↓, the SPACEBAR, moving the Datagrip thumbwheel or pressing the Datagrip trigger.

Exiting the search mode with a SPACEBAR or the Datagrip trigger in Pick List format selects the cursored item. Exiting the search mode with the Datagrip trigger in single entry mode also selects the cursored item. All other exit keys only position the cursor. The SEARCH button is always active. The ALT-S key combination also performs this function.

CLEAR clears all selected entries in the list. This button is only active in the Pick List format. The ALT-C key combination also performs this function.

ESCAPE exits the menu without selecting anything. This button is always active. The ESC key also performs this function.

DICT From the Drug Administration or Numeric Data main screen, brings up the Drug Dictionary in a pop-up menu. From the O.R. Event Record screen, brings up a concatenation of all the items from all the Event submenus in a pop-up menu. This button is only active when selecting drug names from the Drug Administration screen, numeric entry names from the Numeric Data screen, or events from the O.R. Event Record screen. The ALT-D key combination also performs this function.

NOTE: If any menu selections were made BEFORE choosing the DICT function, those entries will be deselected.

A "tagged" field appears to the right of the buttons in the Pick List format. This field displays the number of items currently selected from the displayed list.

Alternate Search Method

An alternate search method is available if there are no key letters displayed in a pop-up menu. If there are no key letters, typing a letter or number automatically enters search mode with the typed letter or number as the first character in the search string.

Selecting Items in Single Entry Format

There are two methods by which to select a pop-up menu item in the Single Entry format:

1. Move the cursor to the desired item using the arrow keys or the Datagrip thumbwheel, and press the ENTER key or the Datagrip trigger.

2. Type the key letter that appears in front of the item. The corresponding menu item is immediately selected and the user is returned to the main screen.

   This method works only if there are not more than 34 entries in the menu. (Key letters are 'a' through 'z' excluding 'x' and 'y', and '0' through '9'.)

Selecting Items in Pick List Format

Since the Pick List format allows for multiple selections from a menu, a check box [ ] appears in front of each item. The check box contains an x when an item is selected, and is empty if the item is not selected.

There are several methods by which to select pop-up menu items in the Pick List format:

1. Move the cursor to the desired item using the arrow keys or the Datagrip thumbwheel, and press the spacebar or the SELECT ENTRY key.

2. Move the cursor to the desired item using the arrow keys or the Datagrip thumbwheel, and press the Datagrip trigger.

3. Type the key letter that appears in front of the item. (Key letters will not appear if there are more than 34 items in a list.)

Repeat the process for each item to be selected.

If you wish to deselect an item, move the cursor to that item and press the spacebar, the SELECT ENTRY key or the Datagrip trigger, or press the key letter (if present).

To enter all of the selections that were made, press the ENTER key or move the cursor to the ENTER button and press the Datagrip trigger. This will also exit the pop-up menu.

To exit without processing the selections, press the ESC key or move the cursor to the ESCAPE button and press the Datagrip trigger.

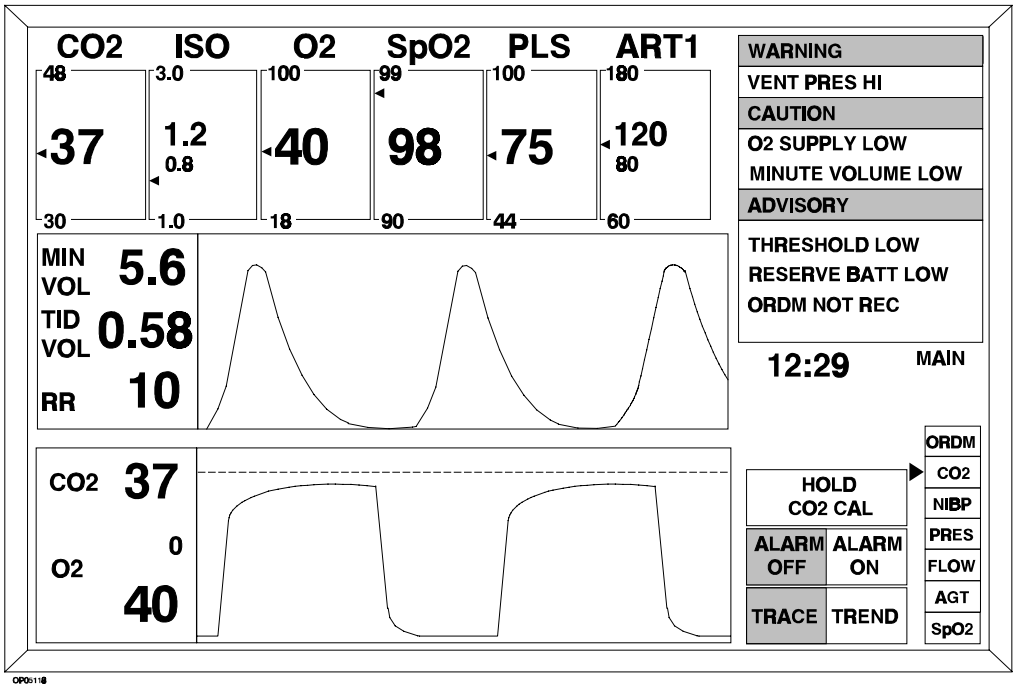
Section 5 - Operation
O.R. Data Manager

Using the O.R. Data Manager

Procedures for starting a case with a network-based O.R. Data Manager or with a floppy disk-based O.R. Data Manager are very similar, but for ease of reference they are described separately. The following procedure applies to floppy disk-based systems. For network-based systems, skip to **Starting a Case with a Network-Based O.R. Data Manager**.

Starting a Case with a Floppy Disk-Based O.R. Data Manager

Following power-up diagnostics, the Narkomed 4 displays the monitor screen on the remote display. Assuming that the central alarm display is not full, an advisory stating that the O.R. Data Manager is not recording is posted in the Advisory window (ORDM NOT REC).

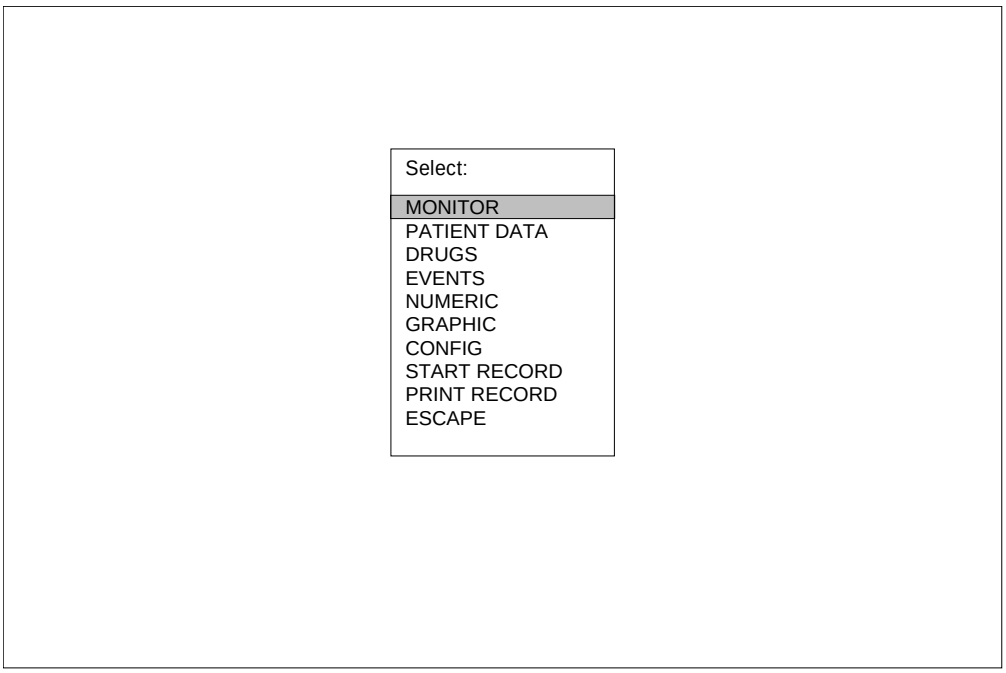


You can initiate the recording of data in two ways:

- Press the START/STOP RECORD key on the keyboard

  OR

- Using the thumbwheel, position the cursor at the ORDM option in the selection list at the right side of the monitor screen, and press the Datagrip trigger. The O.R. Data Manager screen menu will then appear.



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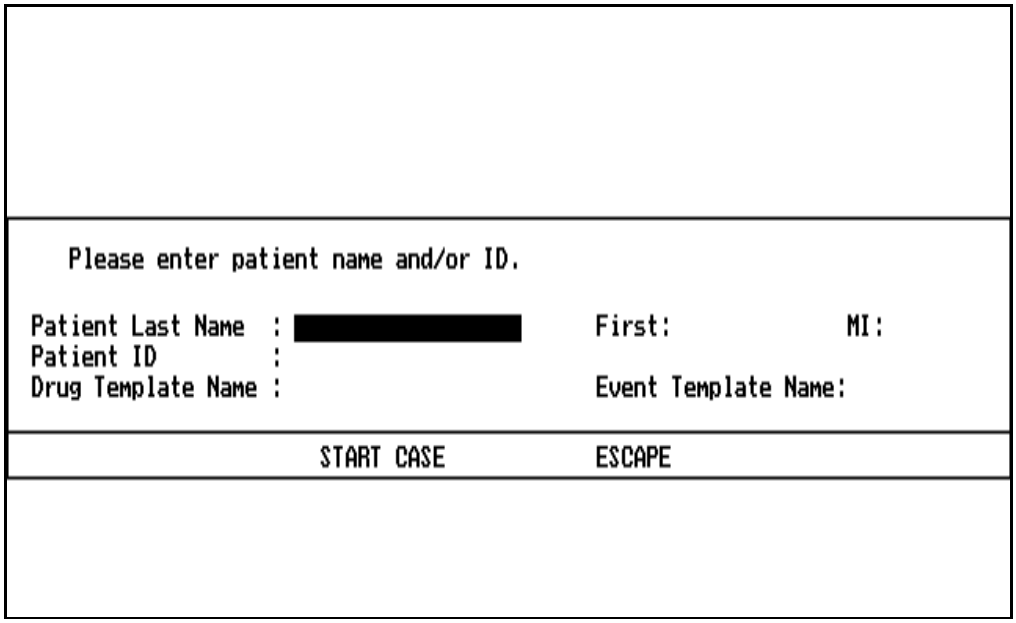
Use the Datagrip to select START RECORD from the O.R. Data Manager screen menu. You will then be prompted to insert a case disk.

Insert the formatted floppy disk for the case into the disk drive. A new disk should be inserted for each new case. If you do not insert a disk, you will be given the option to continue without a disk.

Using a Preconfigured Disk

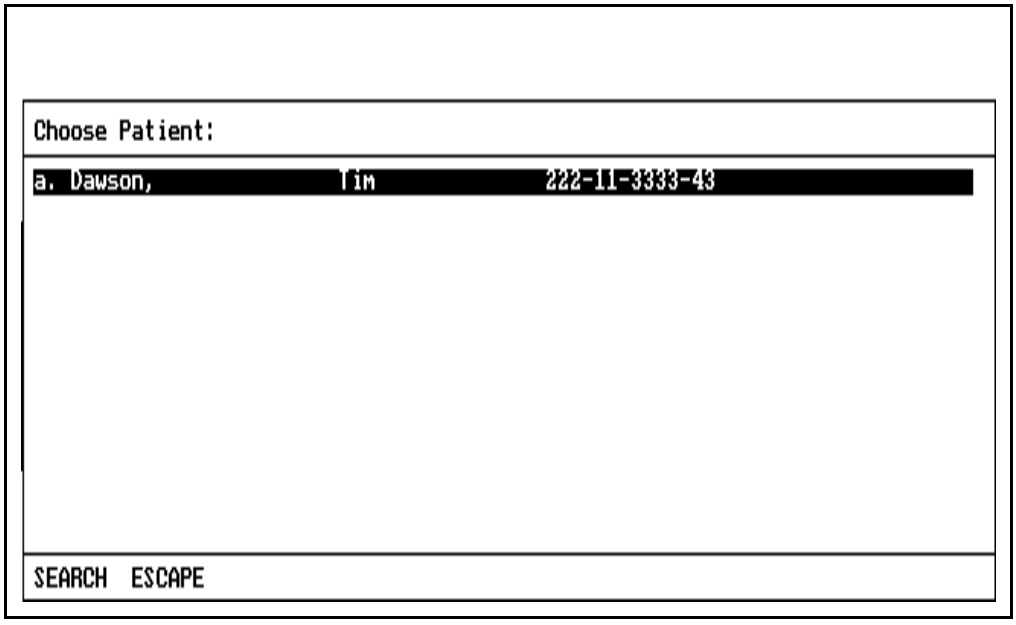
The O.R. Data Manager allows the use of a disk that was configured prior to the start of the case. Preconfigured case data includes Patient Data and Drug and Event Template information.

After you insert a disk that contains preconfigured data, you are prompted for patient identification information:



Entering Data From a Pre-configured Floppy Disk

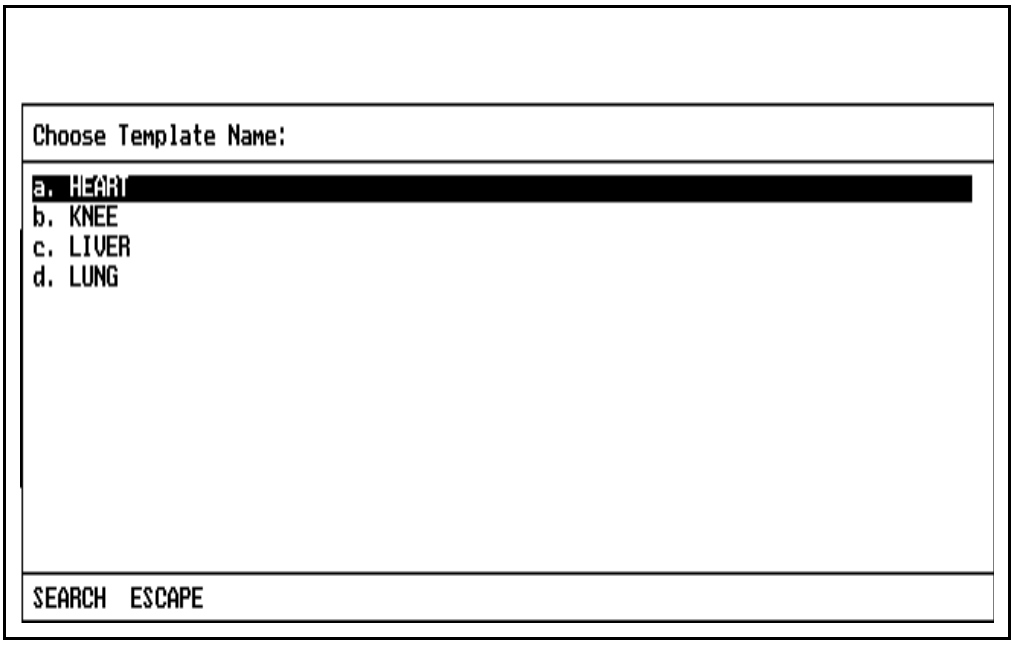
Press the SELECT ENTRY key or the Datagrip trigger. The O.R. Data Manager will display the patient identification information for the preconfigured data contained on the floppy disk. The floppy disk may contain one Patient Data file and multiple drug and event template files.



- To load the displayed patient data, use the procedures specified under **Pop-up Menus**.

- If you do not want to load the patient data, press the ESC key or move the cursor to the ESCAPE button and press the Datagrip trigger.

The patient data information is inserted in the appropriate cells, and the cursor is positioned at the Drug Template Name cell. Press the SELECT ENTRY key or the Datagrip trigger. The O.R. Data Manager will display the drug templates that are found on the floppy disk.



Select the template using the procedures specified under **Pop-up Menus**.

The cursor will move to the Event Template Name cell, allowing you to select the event template from the floppy disk in the same way as the drug template.

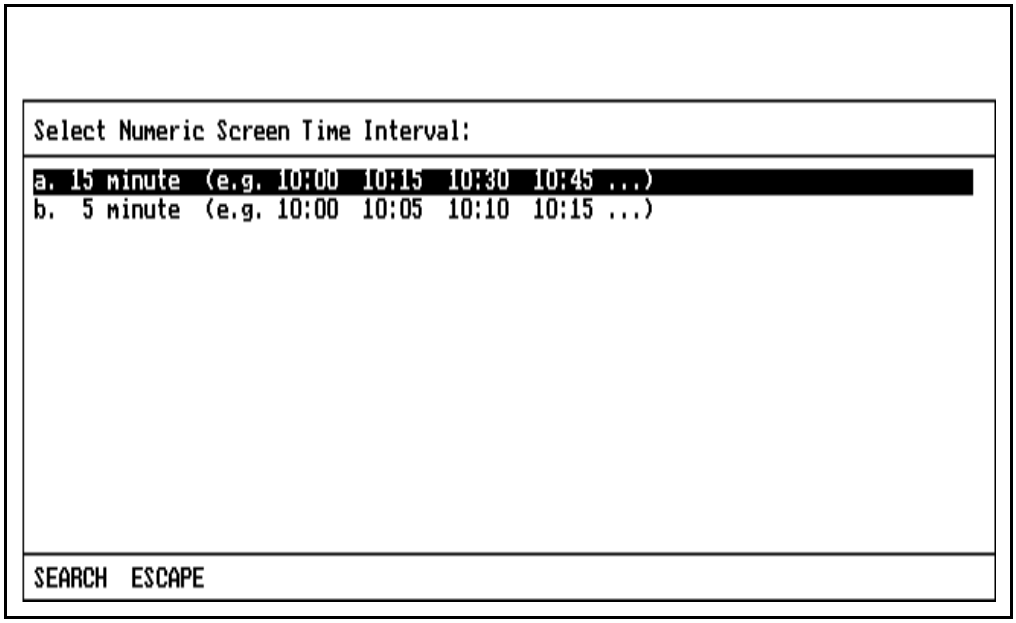
NOTE: If you select a drug template, and there is an event template with the same name found on the disk (and vice versa), that template name will be automatically inserted in the template name cell if the template name cell is blank.

You may also type in template names from the keyboard or you may leave those fields blank. The only information that you **must** enter in order to begin a case is the Patient Last Name or the Patient ID.

Once all the desired information is entered, position the cursor on START CASE, and press the ENTER key or the Datagrip trigger.

If the Numeric Screen Time Interval has been configured to 'query each case' (see **System Configuration**), the following screen appears. This screen allows you to set the time interval for data to be posted in the numeric screen and on the anesthesia record. You can choose either 5 or 15 minute intervals. The 5 minute interval is recommended for shorter cases (less than 2-3 hours), and the 15 minute interval is recommended for longer cases.

(If the system was configured for a specific time interval, this screen will not appear.)



- Select the time interval using the procedures specified under **Pop-up Menus**.

- If you want to exit this screen, select the ESCAPE button or press the ESC key. The numeric screen resolution will default to 15 minutes.

The case is now started and the Monitor screen appears.

Entering Data From the Keyboard

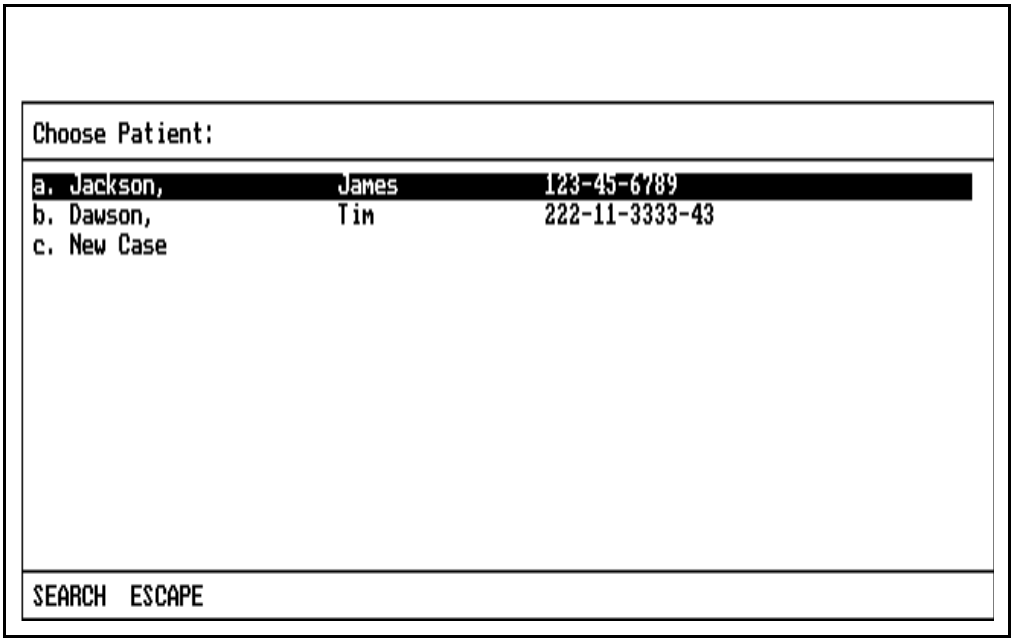
Instead of selecting patient information from a pop-up screen menu, you can also type in the information directly from the keyboard. When the patient information prompt initially appears after you insert your disk, do the following:

1. Enter at least the Patient Last Name or Patient ID.

2. Use the arrow keys or the Datagrip thumbwheel to position the cursor on START CASE.

3. Press the ENTER key or the Datagrip trigger.

The patient information you typed is compared to the preconfigured data on the floppy disk. If they are different, you will be prompted to choose which patient case you want:



To choose the case, use the procedures specified under **Pop-up Menus**.

If you choose NEW CASE, the patient identification prompt will be displayed again to allow you to enter the new patient data. Choosing the ESCAPE button on the pop-up menu returns you to the patient identification prompt.

NOTE: If you do not want to use the preconfigured data on the floppy disk, be sure to remove the disk and insert a blank one before you start the new case. Otherwise the information on the disk will be erased.

After you make your selection, you may be prompted for the numeric screen time interval, depending upon system configuration settings as explained earlier. (If the system was configured for a specific time interval, the numeric time interval selection screen will not appear.) If the screen appears, select the time interval using the procedures specified under **Pop-up Menus**.

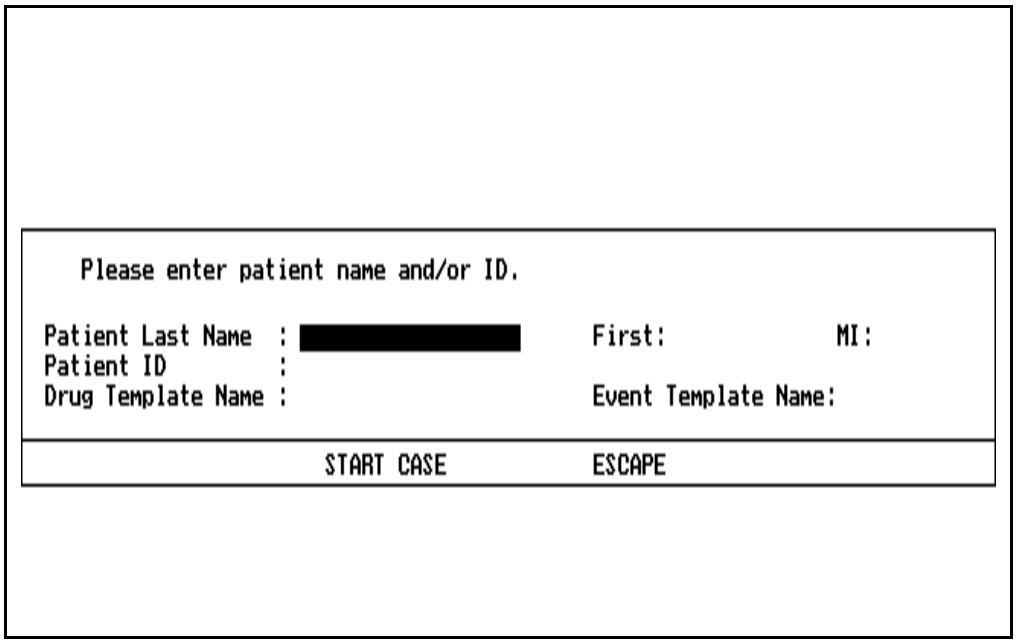
The case is then started and the Monitor screen appears.

Using a Disk With No Preconfigured Data

It is not necessary to use a preconfigured disk for a case. A disk with no preconfigured data may or may not contain old case data; the procedure for using either type of disk is provided below.

Disk with No Prior Case Data

When the disk is inserted, it is checked for existing case data. If no case is found on the disk, you will be prompted for patient identification information:



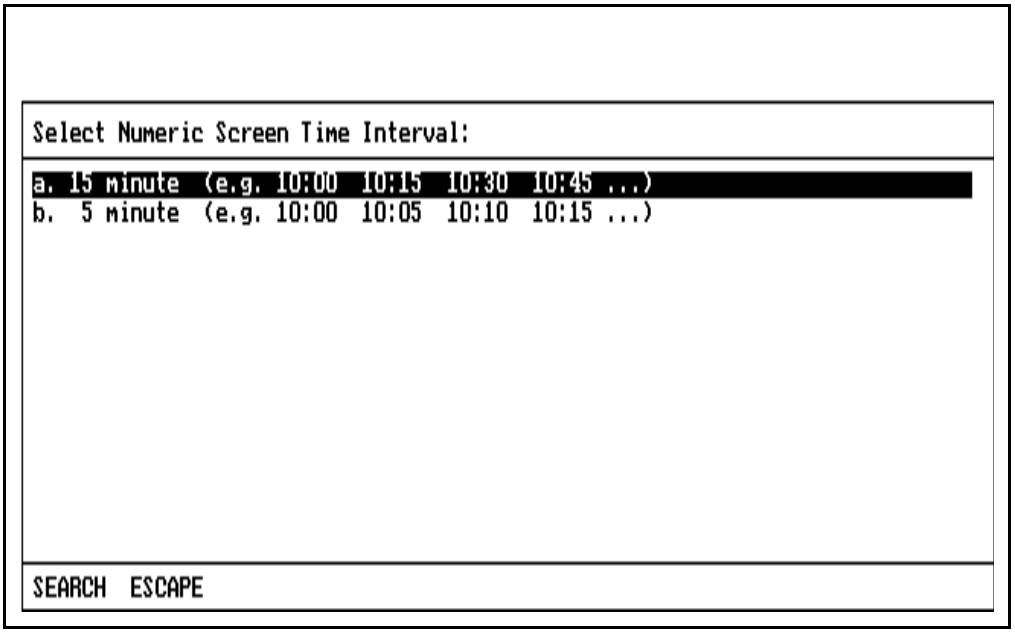
- To begin recording, you must enter at least the Patient Last Name or Patient ID, and then position the cursor on START CASE and press the ENTER key or the Datagrip trigger.

- If you do not want to start the case, press the ESC key, or position the cursor on ESCAPE and press the ENTER key or the Datagrip trigger.

After you enter the patient identification information, you may be prompted to select the numeric screen time interval.

If the Numeric Screen Time Interval has been configured to 'query each case' (see **System Configuration**), the following screen appears. This screen allows you to set the time interval for data to be posted in the numeric screen and on the anesthesia record. You can choose either 5 or 15 minute intervals. The 5 minute interval is recommended for shorter cases (less than 2-3 hours), and the 15 minute interval is recommended for longer cases.

(If the system was configured for a specific time interval, this screen will not appear.)



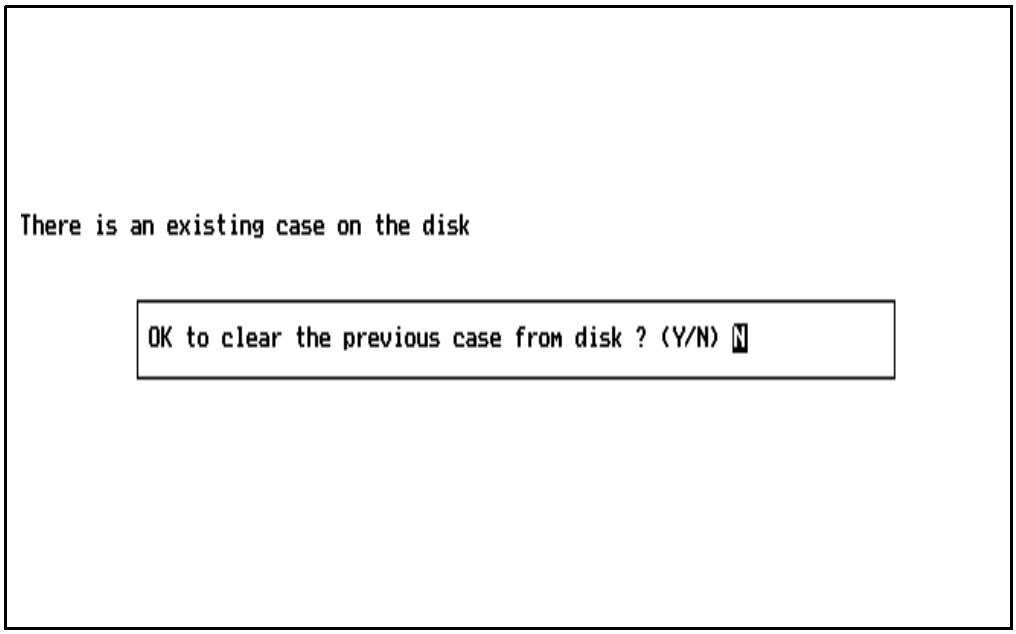
- Select the time interval using the procedures specified under **Pop-up Menus**.

- If you want to exit this screen, select the ESCAPE button or press the ESC key. The numeric screen resolution will default to 15 minutes.

The case is now started and the Monitor screen appears.

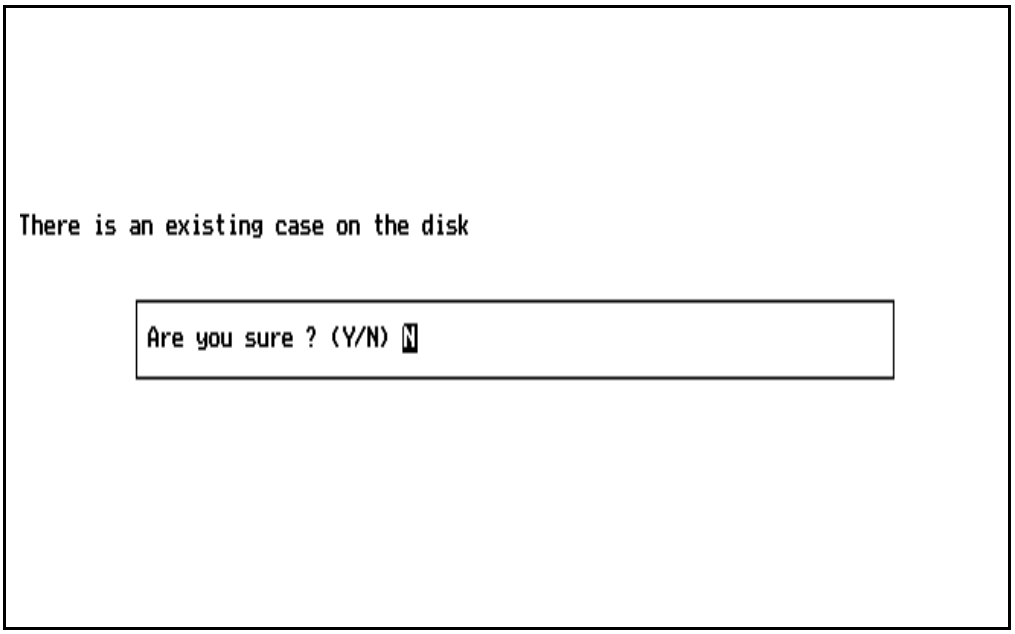
Disk with Prior Case Data

If the inserted disk contains old case data, the following prompt to clear case data appears on the screen:



- If you want to clear all case data contained on the floppy disk, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- If you do not want to clear existing case data, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger. You will then have to remove or replace the disk.

If you specify Y, a second prompt appears to confirm your choice:



- If you want to clear case data from the disk, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.

- If you do not want to clear case data from the disk, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger. You will then have to remove or replace the disk.

If you do not respond within 30 seconds, the case data is not cleared and the prompt is removed from the screen. If you respond with a Y to the confirmation prompt, the program will clear case data.

When the disk is cleared, you are prompted for patient identification information. To start the case, you must enter at least the Patient Last Name or Patient ID, and then position the cursor on START CASE and press the ENTER key or the Datagrip trigger.

Depending upon the Numeric Screen Time Interval configuration option chosen (see **System Configuration**), you may be asked to select the numeric screen time interval. Select the time interval using the procedures specified under **Pop-up Menus**.

The case is then started, and the Monitor screen appears.

Patient Data Pre-entry

When the O.R. Data Manager is not recording, it is possible for the user to enter the Patient Data screen and pre-enter patient data for the next case. If this is done, when the next case is started the data entered on the Patient Data screen will appear on the patient identification prompt and the cursor will be placed on the START CASE button. Press the ENTER key or the Datagrip trigger to start the case with the pre-entered data.

Note that if patient data is pre-entered, no check for preconfigured data is performed. Any preconfigured data on the floppy will be overwritten by the pre-entered data.

For more information on pre-entering patient data, see the **Patient Data Screen** section of this manual.

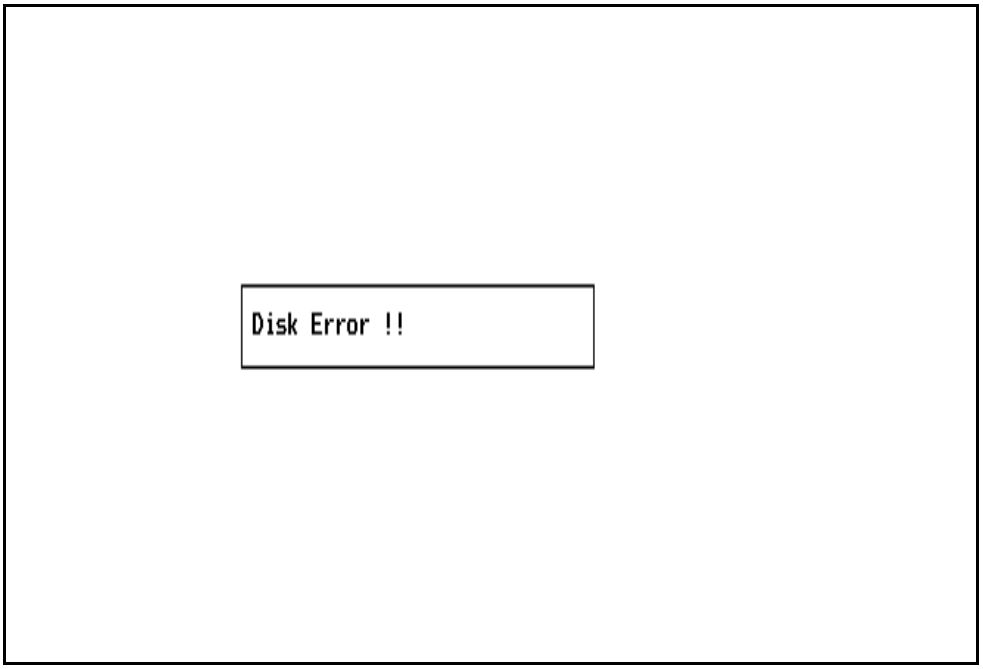
Emergency Start

In an emergency, it is desirable to have a way to start a case with a single keystroke. This can be done from the patient identification prompt by pressing either the STAT DRUG or STAT EVENT key. When one of these keys is pressed at the patient identification prompt, the case is started immediately; no check for preconfigured data is performed, and the requirement that a last name or ID be entered is bypassed. If no last name or ID is entered, a temporary patient ID is assigned by the O.R Data Manager so the case can be identified. The user can then enter the patient name and actual patient ID later in the case when time permits.

Note that if STAT DRUG or STAT EVENT is pressed at the patient identification prompt and the disk contains preconfigured data, the preconfigured data will be erased.

Disk Error Messages

An error message appears on the screen if there is a problem reading or writing the disk.



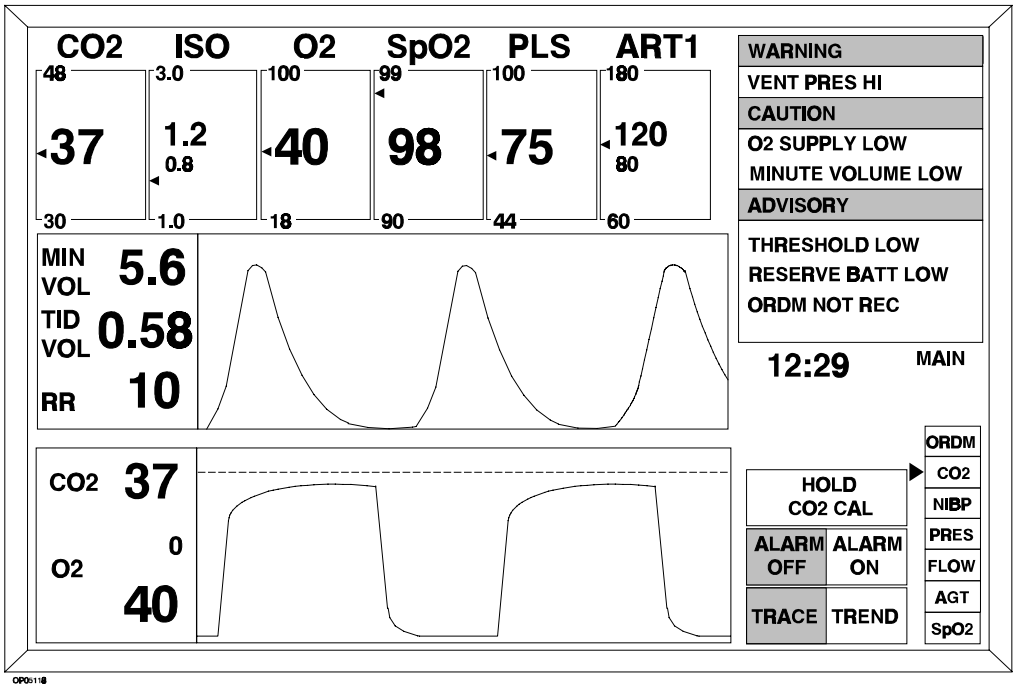
The following table lists possible error messages.

ERROR MESSAGE	CORRECTIVE ACTION
"Disk not inserted!!"	• Insert a formatted disk.
"Disk not formatted!!"	• Insert a formatted disk.
"Disk full!!"	• Insert a new formatted disk.
"Disk write-protected!!"	• Remove disk, close the write protect tab on the disk, and retry. • Use a different formatted disk and retry.
"Disk error!!"	• Ensure that the disk is 1.4 MB, formatted, and that the write protect tab is closed; retry. • If error persists, contact an NAD qualified technical service representative.

Section 5 - Operation
O.R. Data Manager

Starting a Case with a Network-Based O.R. Data Manager

Following power-up diagnostics, the Narkomed 4 displays the monitor screen on the remote display. Assuming that the central alarm display is not full, an advisory stating that the O.R. Data Manager is not recording is posted in the Advisory window (ORDM NOT REC).

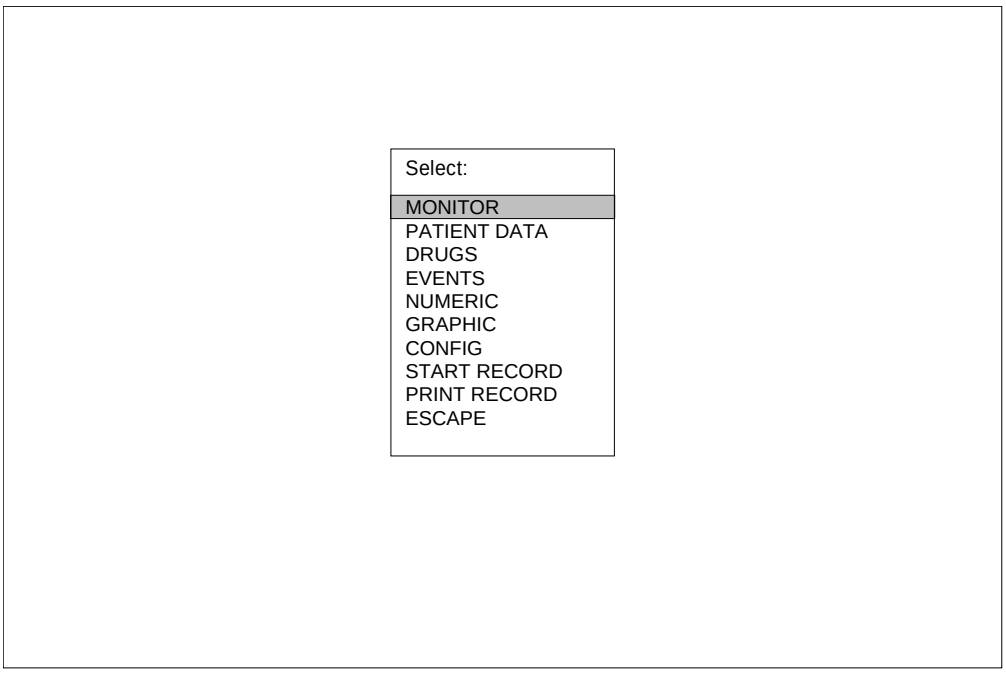


You can initiate the recording of data in two ways:

- Press the START/STOP RECORD key on the keyboard

  OR

- Using the thumbwheel, position the cursor at the ORDM option in the selection list at the right side of the monitor screen, and press the Datagrip trigger. The O.R. Data Manager screen menu will then appear.

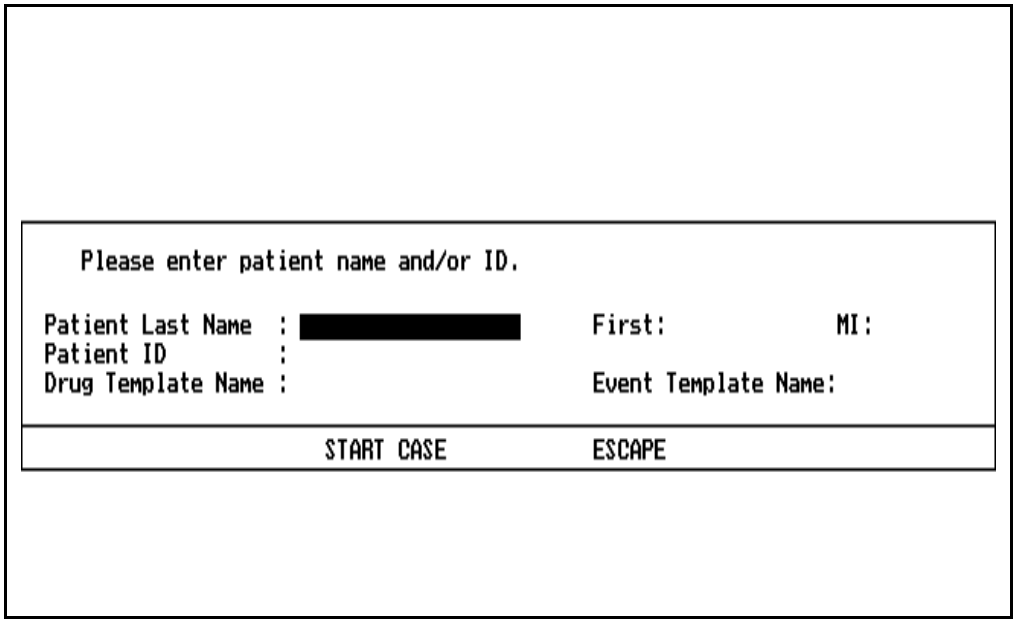


Use the Datagrip to select START RECORD from the O.R. Data Manager screen menu. You will then be prompted to insert a case disk.

Using Preconfigured Data

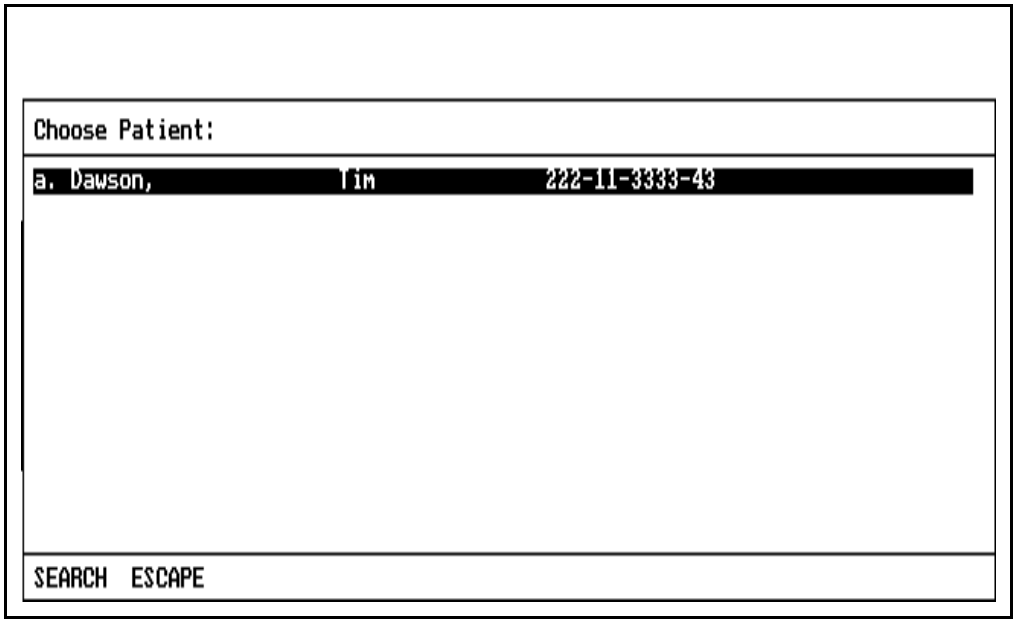
The O.R Data Manager allows you to use data that was configured prior to the start of the case. Preconfigured case data includes Patient Data and Drug and Event Template information.

After you press START RECORD, you are prompted for patient identification information:



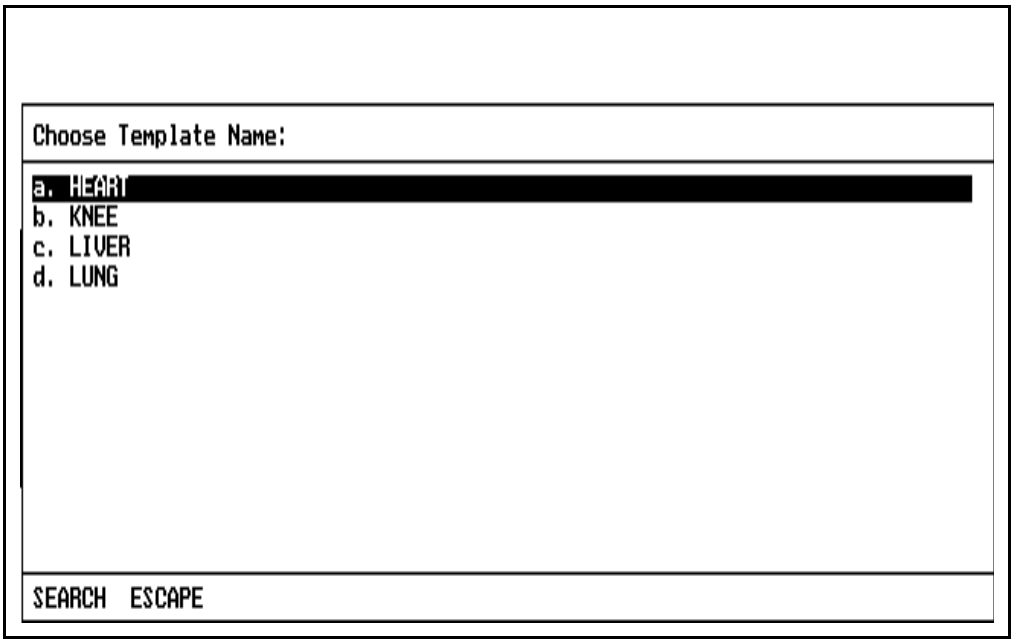
Entering Data From the Network Disk

Press the SELECT ENTRY key or the Datagrip trigger. The O.R. Data Manager will display patient identification information for all preconfigured patient data stored on the network. The network disk may contain multiple Patient Data and drug and event template files.



1. Select the patient using the procedures specified under **Pop-up Menus**.

The patient data information is inserted in the appropriate cells, and the cursor is positioned at the Drug Template Name cell. Press the SELECT ENTRY key or the Datagrip trigger. The O.R. Data Manager will display the drug templates that are found on the network storage device.



1. Select the desired template using the procedures specified under **Pop-up Menus**.

The cursor will move to the Event Template Name cell, allowing you to select the event template from network storage in the same way as the drug template.

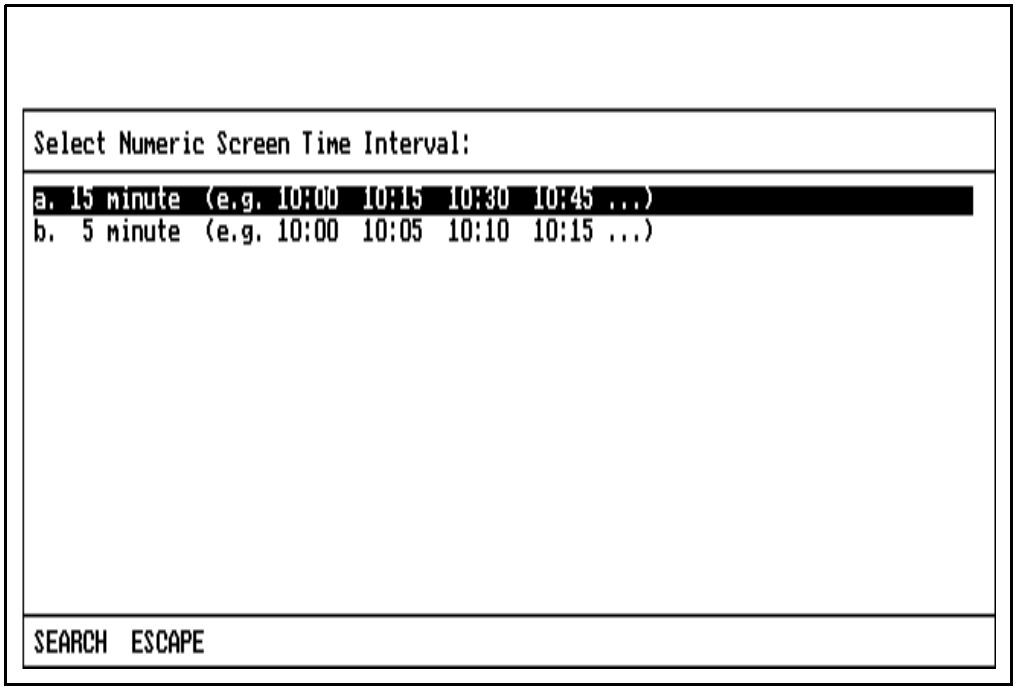
NOTE: If you select a drug template, and there is an event template with the same name found on the disk (and vice versa), that template name will be automatically inserted in the template name cell if the template name cell is blank.

You may also type in template names from the keyboard or you may leave those fields blank. The only information that you **must** enter in order to begin a case, is the Patient Last Name or the Patient ID.

Once all the desired information is entered, position the cursor on START CASE, and press the ENTER key or the Datagrip trigger.

If the Numeric Screen Time Interval has been configured to 'query each case' (see **System Configuration**), the following screen appears. This screen allows you to set the time interval for data to be posted in the numeric screen and on the anesthesia record. You can choose either 5 or 15 minute intervals. The 5 minute interval is recommended for shorter cases (less than 2-3 hours), and the 15 minute interval is recommended for longer cases.

(If the system was configured for a specific time interval, this screen will not appear.)



- Select the desired time interval using the procedures specified under **Pop-up Menus**.

- If you want to exit this screen, press the ESC key or position the cursor on the ESCAPE button and press the ENTER key or the Datagrip trigger. The numeric screen resolution will default to 15 minutes.

The case is now started and the Monitor screen appears.

Entering Data From the Keyboard

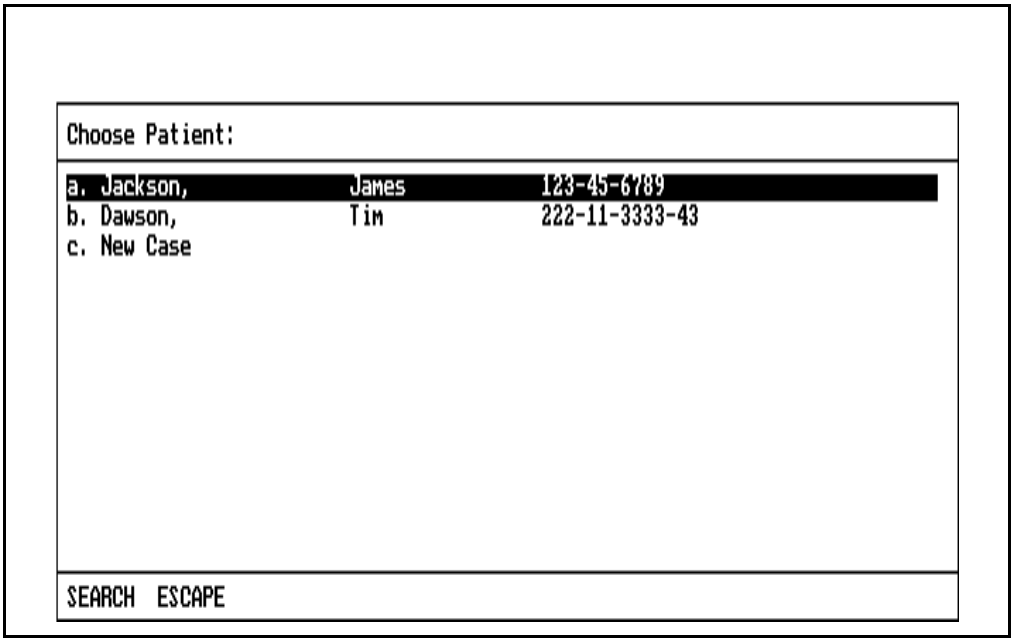
Instead of selecting patient information from a pop-up screen menu, you can also type in the information directly from the keyboard. When the patient information prompt initially appears after you press START RECORD, do the following:

1. Enter at least the Patient Last Name or Patient ID.

2. Use the arrow keys or the Datagrip thumbwheel to position the cursor on START CASE.

3. Press the ENTER key or the Datagrip trigger.

The patient information you typed is compared to the patient data found on the network (if any). If a match is not found, you will be prompted to choose which patient case you want:



To choose the case, follow the procedures specified under **Pop-up Menus**.

You can select the patient name you just typed, one of the cases stored on the network, or a completely different one (NEW CASE).

If you choose NEW CASE, the patient information prompt will be displayed again to allow you to enter the new patient data. Pressing the ESC key or moving the cursor to the ESCAPE button and pressing the ENTER key or the Datagrip trigger also returns you to the patient identification prompt.

Depending upon the Numeric Screen Time Interval configuration option chosen (see **System Configuration**), after you make your selection, you may be prompted for the Numeric Data screen time interval. Select the time interval using the procedures specified under **Pop-up Menus**.

The case is then started and the Monitor screen appears.

Patient Data Pre-Entry

When the O.R. Data Manager is not recording, it is possible for the user to enter the Patient Data screen and pre-enter patient data for the next case. If this is done, when the next case is started the data entered on the Patient Data screen will appear on the patient identification prompt and the cursor will be placed on the START CASE button. Press the ENTER key or the Datagrip trigger to start the case with the pre-entered data.

Note that if patient data is pre-entered, no check for preconfigured data is performed.

For more information on pre-entering patient data, see the **Patient Data Screen** section of this manual.

Emergency Start

In an emergency, it is desirable to have a way to start a case with a single keystroke. This can be done from the patient identification prompt by pressing either the STAT DRUG or STAT EVENT key. When one of these keys is pressed at the patient identification prompt, the case is started immediately; no check for preconfigured data is performed, and the requirement that a last name or ID be entered is bypassed. If no last name or ID is entered, a temporary patient ID is assigned by the O.R Data Manager so the case can be identified. The user can then enter the patient name and actual patient ID later in the case when time permits.

Note that if STAT DRUG or STAT EVENT is pressed at the patient identification prompt, no check for preconfigured data is performed.

Data Recording During the Case

Data is written to disk every 30 seconds. A maximum of 14 hours of data can be recorded per case. If a case will last longer than 14 hours, you should prepare two preconfigured cases prior to the start. Each preconfigured case should include the required templates and patient/case identification information. These cases can be prepared using PC Prep/View before the case begins.

Before the 14 hours has elapsed, you should print a copy of the anesthesia record. If you are recording to floppy disk, do not remove the disk from the disk drive while the anesthesia record is being printed. When the print process is completed, stop recording and remove the floppy disk from the drive. Then, insert the second disk into the disk drive and repeat the procedure to start a new case. If you are recording to a network, print the record, stop recording, and start the second part of the case. (For more information about printing a record, refer to *Printing Anesthesia Records*.)

On floppy disk-based systems, if you insert a new floppy disk while the O.R. Data Manager is recording, the disk is checked for previous case data. If previous data exists on the disk, you will either have to replace the disk with a clean one, or allow the O.R. Data Manager to clear the existing data. Once the disk is clean, the case data in memory will be copied to the disk, and subsequent recorded data will be appended to the disk. Only the data required for the printed anesthesia record will be copied to disk in this manner; physiological data for the PC Prep/View View Case application will not be copied, and the recording of View Case data will begin at the time the new disk is inserted. For more information on the View Case application, see the *PC Prep/View Operator's Manual*.

Under specific power-up or reset conditions (for instance, following a power failure), the O.R Data Manager will load data from a prior case. The last recorded time of the case must be within 15 minutes of the current time. The prior case is checked against the current case on the O.R. Data Manager hard drive. If they are the same, the prior case data will be loaded into memory, and subsequent recorded data will be appended to the case.

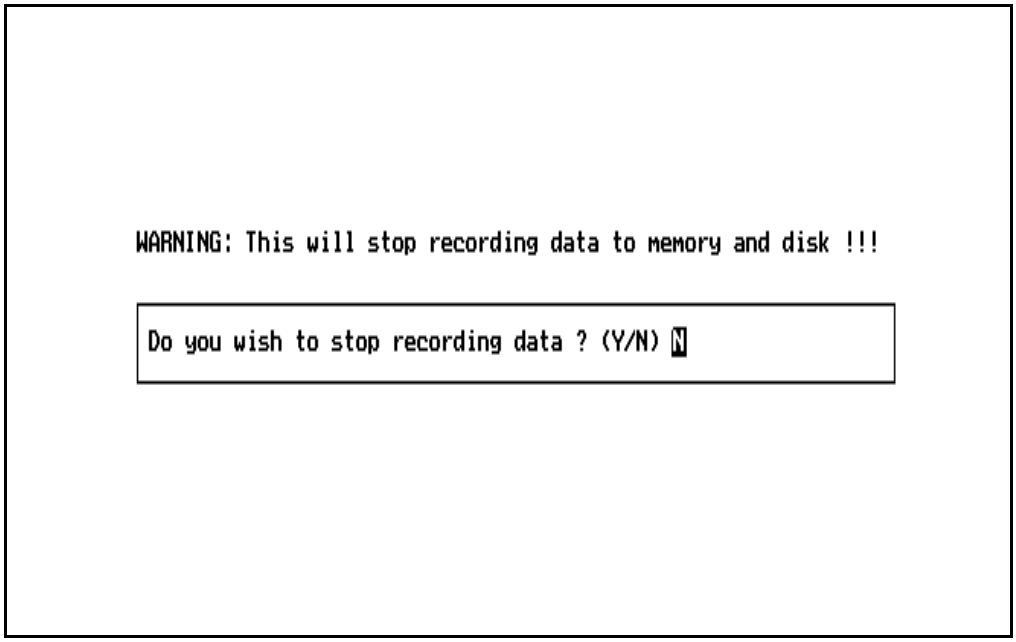
Ending a Case with the O.R. Data Manager

You can stop the recording of data in one of two ways:

- Press the START/STOP RECORD key, or
- Using the Datagrip, select the STOP RECORD option from the screen menu.

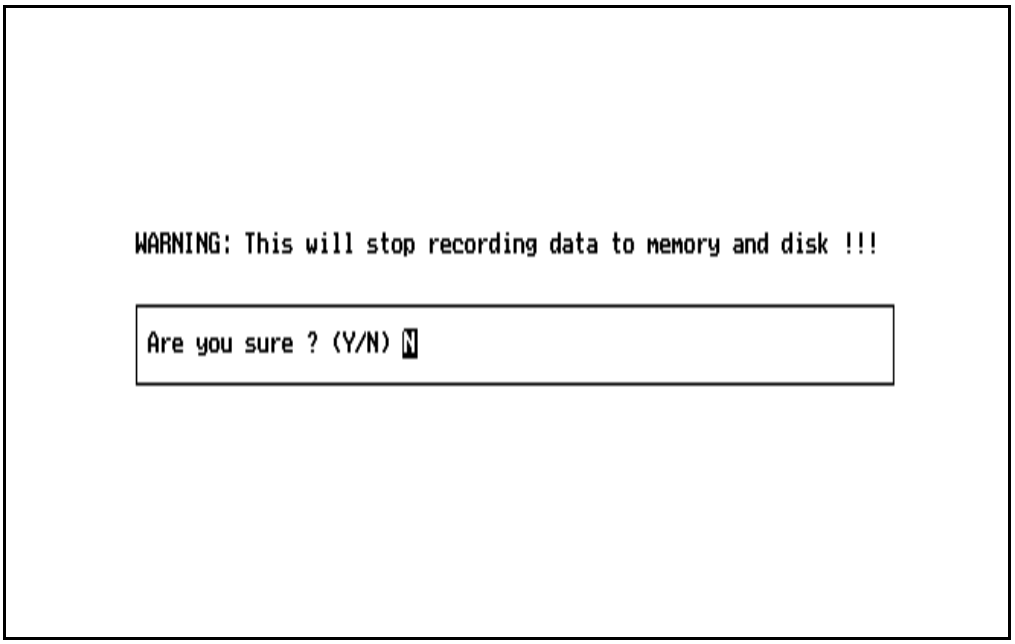
NOTE: You can invoke the screen menu in the Monitor screen by pressing the Datagrip trigger. For information on how to invoke the screen menu from the O.R. Data Manager screens, see the specific operating instructions for each screen.

You will then be queried to make sure that you want to end the case:



- If you want to stop recording, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- If you do not want to stop recording, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

If you specify Y, a second prompt appears to confirm your choice:



- If you want to stop recording, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- If you do not want to stop recording, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

If you do not respond within 30 seconds, the prompt is removed from the screen and recording continues.

If you respond with a Y to the confirmation prompt, any final outstanding data will be written to the disk, and recording will stop. If the O.R. Data Manager is connected to a Vitalert 3000 Series monitor, all Vitalert alarms that are on will be set to standby.

Whenever the O.R. Data Manager is not recording, an advisory message indicating this will be sent to the host machine.

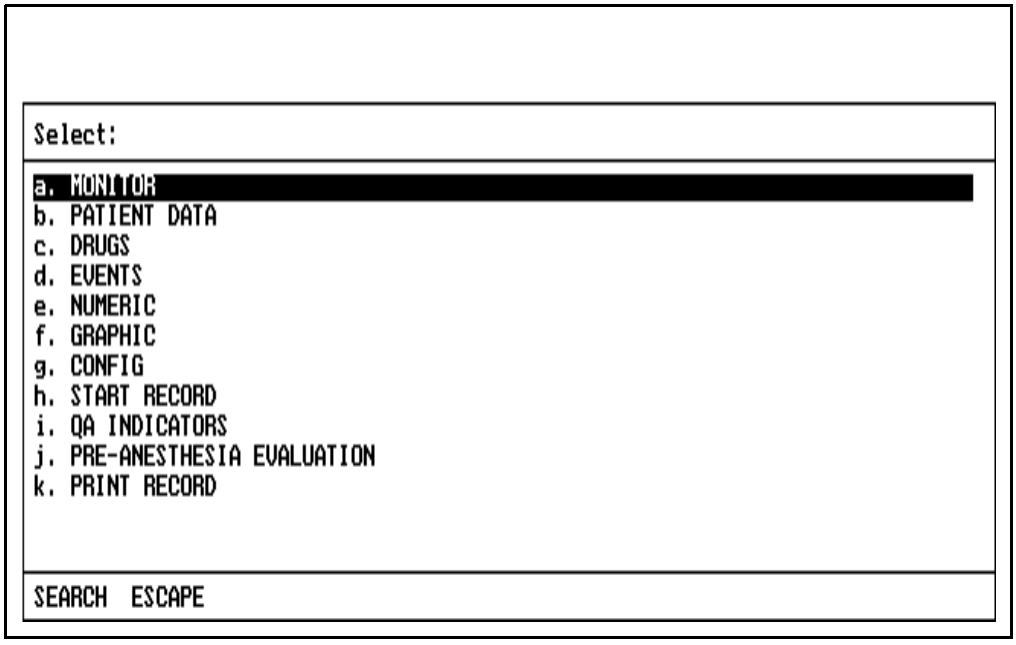
Section 5 - Operation
O.R. Data Manager

Exiting the Monitor Screen

To exit the Monitor screen, press any of the other Screen keys, or the Datagrip trigger, or the SELECT ENTRY key.

Displaying the O.R. Data Manager Screen Menu

If you press the Datagrip trigger or the SELECT ENTRY key, the following pop-up screen menu appears:



Make the desired selection according to the procedures described earlier in this section under **Pop-up Menus**.

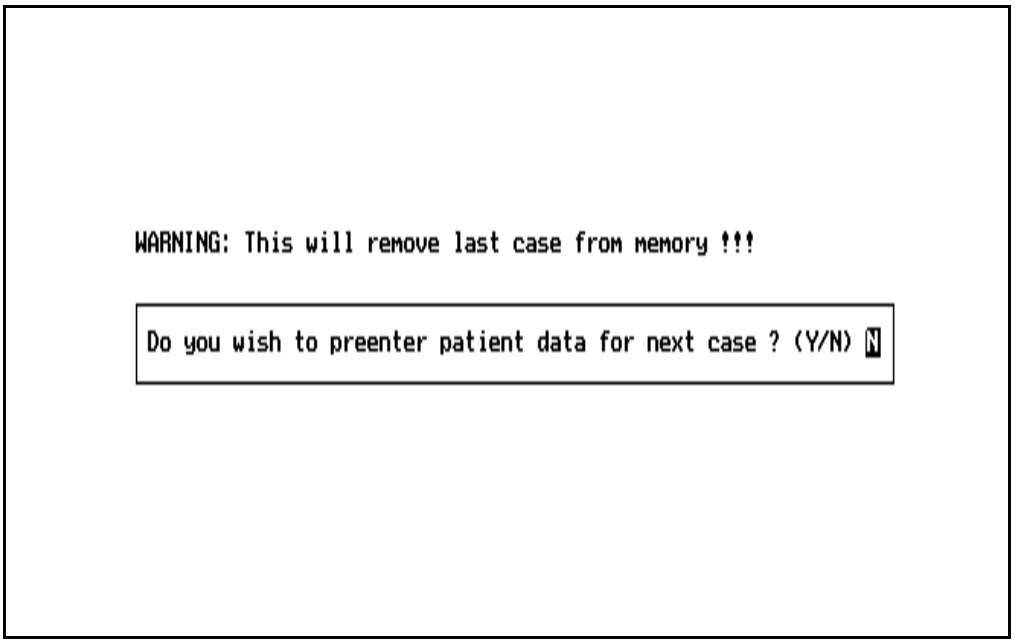
Patient Data Screen

The Patient Data screen is used to enter, edit, and view patient/case information, such as name, patient ID, procedure, etc.

Selecting the Screen

To enter the Patient Data screen, press the PATIENT DATA key, or use the Datagrip to select PATIENT DATA from the O.R. Data Manager screen menu.

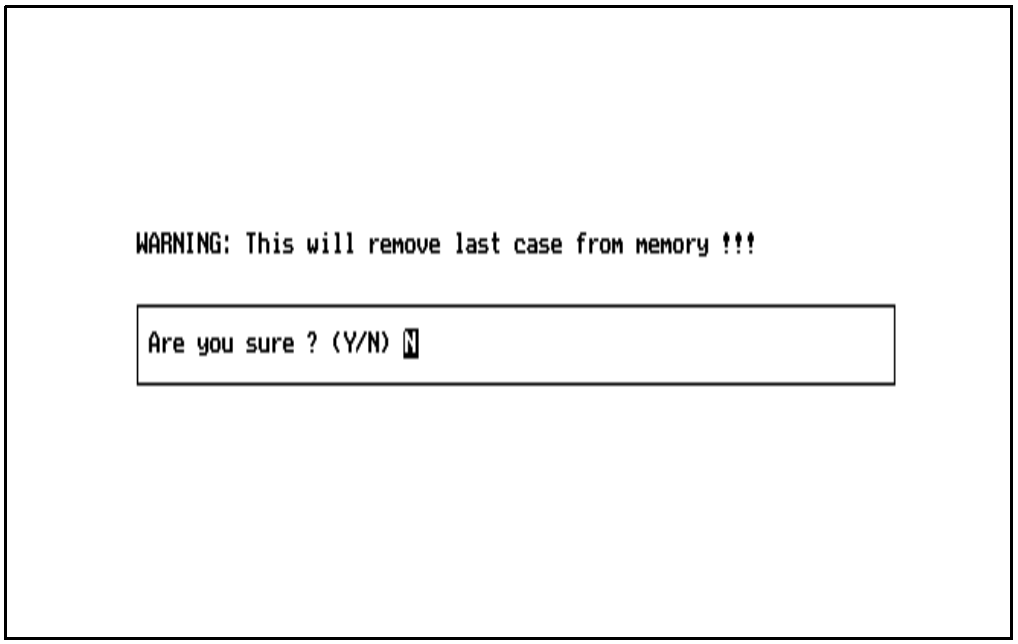
The Patient Data screen can be selected either during a case or between cases. If it is selected between cases (when the O.R. Data Manager is not recording), the data entered will be used for the next case that is run on the O.R. Data Manager. Because pre-entering the data for the next case will cause the data for the last case to be overwritten, the following confirmation prompt appears:



- If you want to pre-enter the patient data for the next case, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- If you do not want to pre-enter patient data, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

If you do not respond within 30 seconds, the prompt is removed from the screen and the Patient Data screen is not entered.

If the user specifies Y, a second prompt appears confirming the choice:



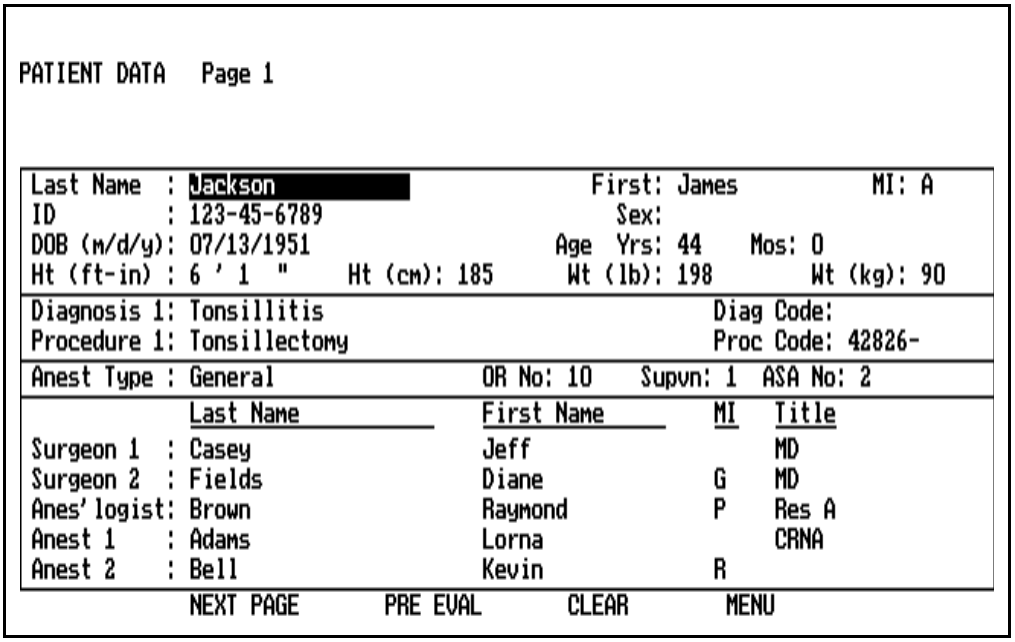
- If you want to pre-enter patient data for the next case, press the Y key or rotate the thumbwheel to display Y and press the Datagrip trigger.
- If you do not want to pre-enter patient data, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

If you do not respond within 30 seconds, the prompt is removed from the screen and the Patient Data screen is not entered.

The Patient Data screen looks and acts the same whether it is being used for pre-entering data or entering data during a case. The only difference is that when data is being pre-entered, the title will be "PATIENT DATA PRE-ENTRY" rather than "PATIENT DATA".

If patient data has not been pre-entered for a case, all patient data is cleared from memory at the start of a case. After memory has been cleared, any preconfigured patient data contained on the floppy disk or selected from the network is loaded into memory. Note that if patient data was pre-entered, no check for preconfigured data is performed.

When the Patient Data screen appears on the remote display, the cursor appears in the Last Name data cell.


PATIENT DATA Page 1
Last Name : Jackson First: James MI: A
ID : 123-45-6789 Sex:
DOB (m/d/y): 07/13/1951 Age Yrs: 44 Mos: 0
Ht (ft-in) : 6 ' 1 " Ht (cm): 185 Wt (lb): 198 Wt (kg): 90
Diagnosis 1: Tonsillitis Diag Code:
Procedure 1: Tonsillectomy Proc Code: 42826-
Anest Type : General OR No: 10 Supvn: 1 ASA No: 2
Last Name First Name MI Title
Surgeon 1 : Casey Jeff MD
Surgeon 2 : Fields Diane G MD
Anes'logist: Brown Raymond P Res A
Anest 1 : Adams Lorna CRNA
Anest 2 : Bell Kevin R
NEXT PAGE PRE EVAL CLEAR MENU

Entering Data

The date of birth (DOB) row accepts up to two digits for the month, up to two digits for the day, and four digits for the year. For ease of data entry at the start of a case or after Patient Data is cleared, the DOB year cell is initialized to "19__", so that you only have to enter the last two digits. The BKSP key may be used if year "18xx" is needed. You do not need to press ENTER between DOB cells; the cursor advances automatically. When the date of birth is entered, the patient age in years and months is automatically calculated and placed in the AGE cell. The maximum patient age that can be entered is 120 years, 0 months.

The Ht and Wt cells accept only numeric entries. O.R. Data Manager has an auto-conversion feature for the height and weight entries. When the patient's height in feet and inches is entered in the Ht (ft-in) cell, the patient's height in centimeters is automatically calculated and entered in the Ht (cm) cell (and vice versa). The same type of conversion is performed for the Wt (lb) and Wt (kg) cells.

The Sex cell accepts only upper case or lower case letters F or M.

The Supvn cell refers to the anesthesiologist level of supervision. It specifies the number of operating rooms supervised by the anesthesiologist and accepts only one digit.

The ASA No cell accepts only four alphanumeric characters.

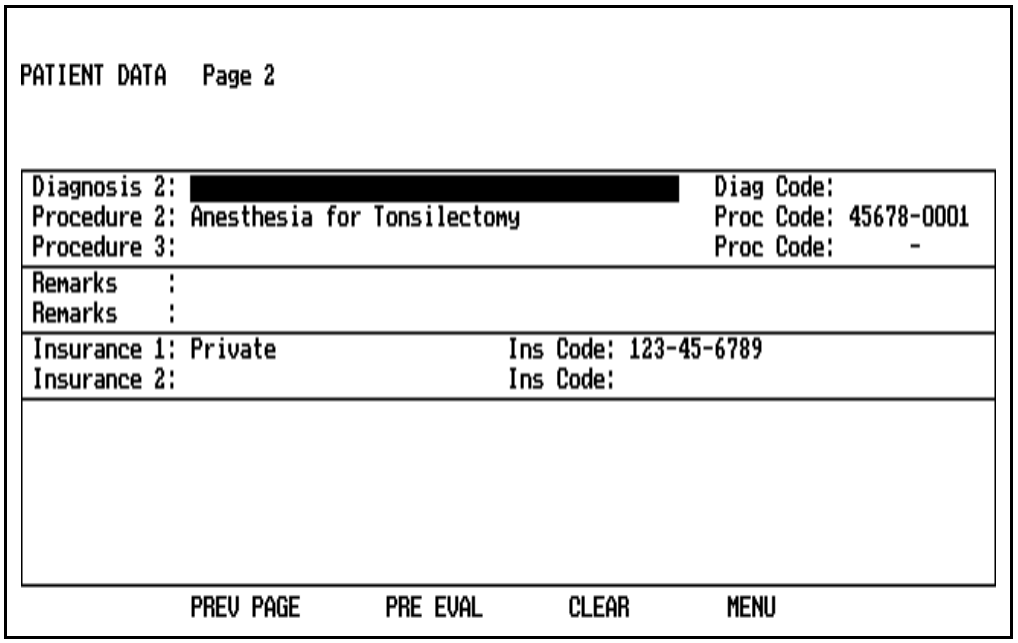
The Diagnosis cell accepts any alphanumeric characters.

Entry procedures for the Procedure, Anesthesia Type, Surgeon, Anesthesiologist, and Anesthetist cells are described later in this section.

Patient Data Screen Page 2

Set the cursor on NEXT PAGE and press ENTER or the Datagrip trigger, or use the PAGE and ↓ keys. Page 2 of the Patient Data Screen will be displayed. The Diagnosis, Remarks, and Ins Code cells accept any alphanumeric characters.

Entry procedures for the Procedure and Insurance cells are described later in this section.



Entering Surgical Procedures

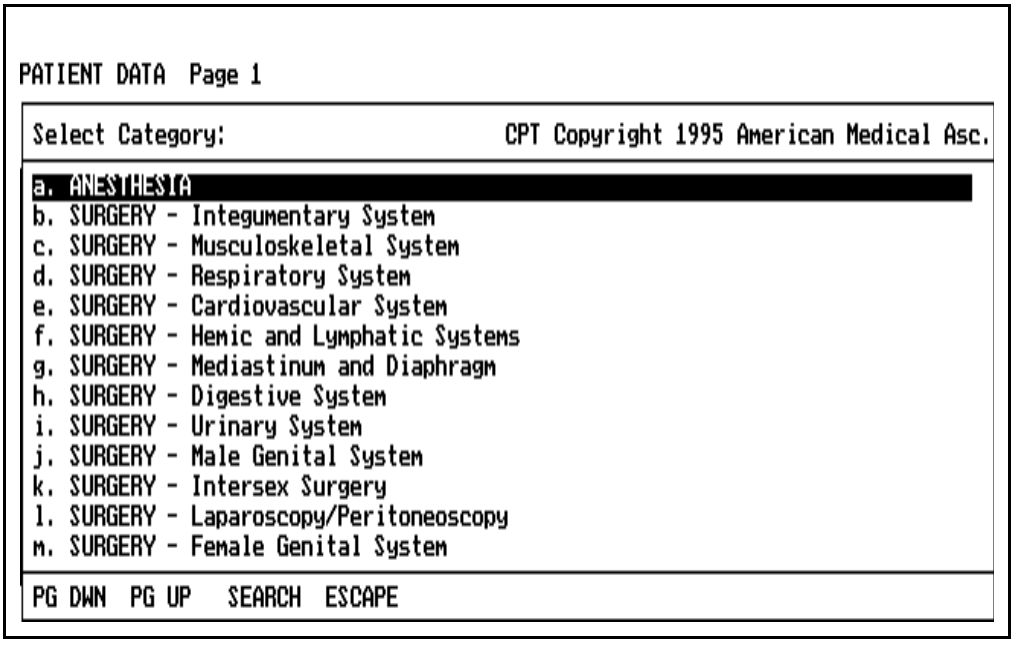
The procedures and their associated codes can be typed in from the keyboard or entered from a pop-up menu. The content of the procedure pop-up menu is site-configurable.

Menu lists are configured using the PC Prep/View software program and are later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

To select procedures from the pop-up menu:

1. In the Patient Data screen, set the cursor to any of the three cells labeled Procedure or Proc Code. One of these cells is on Page one of the Patient Data screen, and two are on Page two of the Patient Data screen.

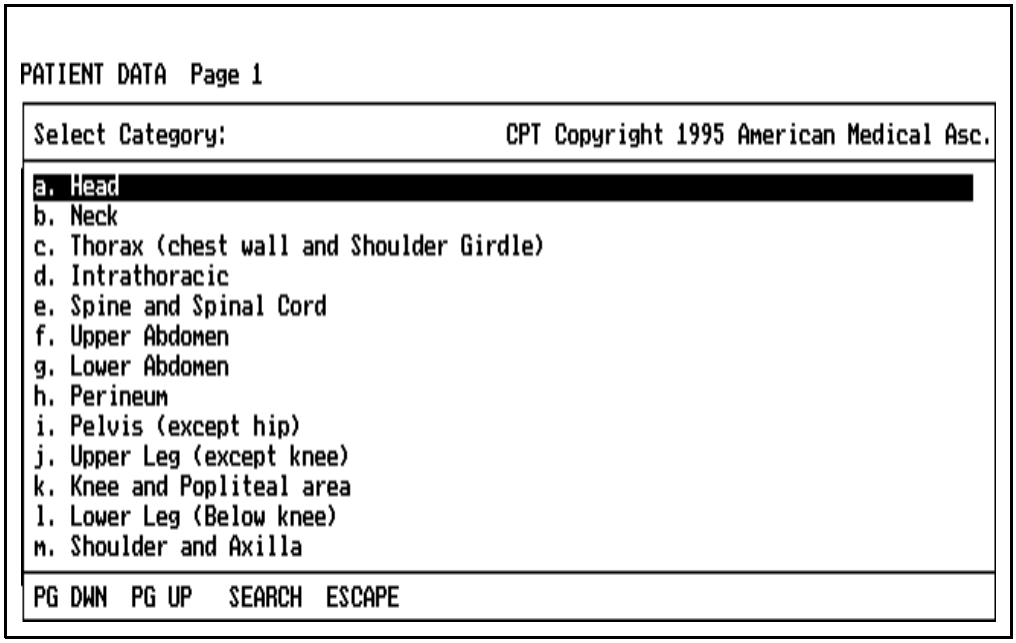
2. Press the SELECT ENTRY key or the Datagrip trigger. This displays a pop-up menu.


PATIENT DATA Page 1
Select Category:
CPT Copyright 1995 American Medical Asc.
a. ANESTHESIA
b. SURGERY - Integumentary System
c. SURGERY - Musculoskeletal System
d. SURGERY - Respiratory System
e. SURGERY - Cardiovascular System
f. SURGERY - Hemic and Lymphatic Systems
g. SURGERY - Mediastinum and Diaphragm
h. SURGERY - Digestive System
i. SURGERY - Urinary System
j. SURGERY - Male Genital System
k. SURGERY - Intersex Surgery
l. SURGERY - Laparoscopy/Peritoneoscopy
m. SURGERY - Female Genital System
PG DWN PG UP SEARCH ESCAPE

3. Make the desired selection using the procedures described earlier in this section under **Pop-up Menus.**

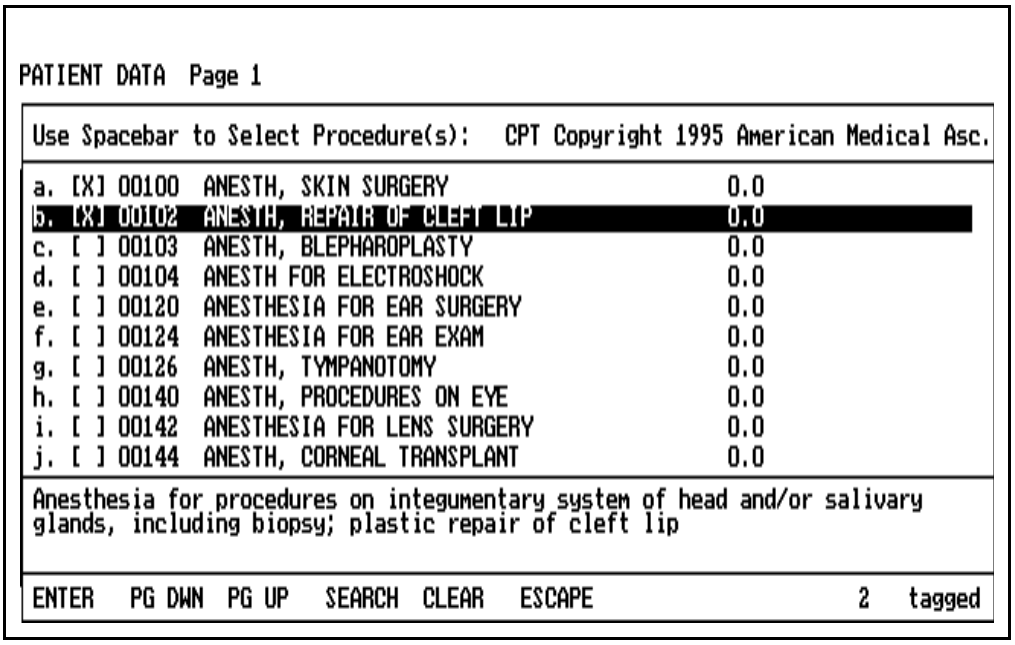
Making the selection causes a submenu to appear which either specifies the procedures or lists the subgroups within the category.

4. Make the desired selection using the procedures described under **Pop-up Menus**.



The Patient Data screen allows up to three Procedures and their Codes to be entered. If Pick List format has been chosen, all three procedures may be selected at the same time even though they appear on different pages of the Patient Data screen. If there are no existing entries when making the first selection, and the Pick List format has been chosen, up to three selections can be made. If one procedure has already been entered, up to two selections can be made if the cursor is on a blank entry. If the cursor is on a nonblank entry, only one procedure can be selected to replace the existing entry.

If two procedures have already been entered in the Patient Data screen and the Procedure menu is accessed, one selection can be made. If the cursor is on a nonblank entry, the new selection will replace the existing entry.


PATIENT DATA Page 1
Use Spacebar to Select Procedure(s): CPT Copyright 1995 American Medical Asc.
a. [X] 00100 ANESTH, SKIN SURGERY 0.0
b. [X] 00102 ANESTH, REPAIR OF CLEFT LIP 0.0
c. [ ] 00103 ANESTH, BLEPHAROPLASTY 0.0
d. [ ] 00104 ANESTH FOR ELECTROSHOCK 0.0
e. [ ] 00120 ANESTHESIA FOR EAR SURGERY 0.0
f. [ ] 00124 ANESTHESIA FOR EAR EXAM 0.0
g. [ ] 00126 ANESTH, TYMPANOTOMY 0.0
h. [ ] 00140 ANESTH, PROCEDURES ON EYE 0.0
i. [ ] 00142 ANESTHESIA FOR LENS SURGERY 0.0
j. [ ] 00144 ANESTH, CORNEAL TRANSPLANT 0.0
Anesthesia for procedures on integumentary system of head and/or salivary glands, including biopsy; plastic repair of cleft lip
ENTER PG DWN PG UP SEARCH CLEAR ESCAPE 2 tagged

Entering Anesthesia Type

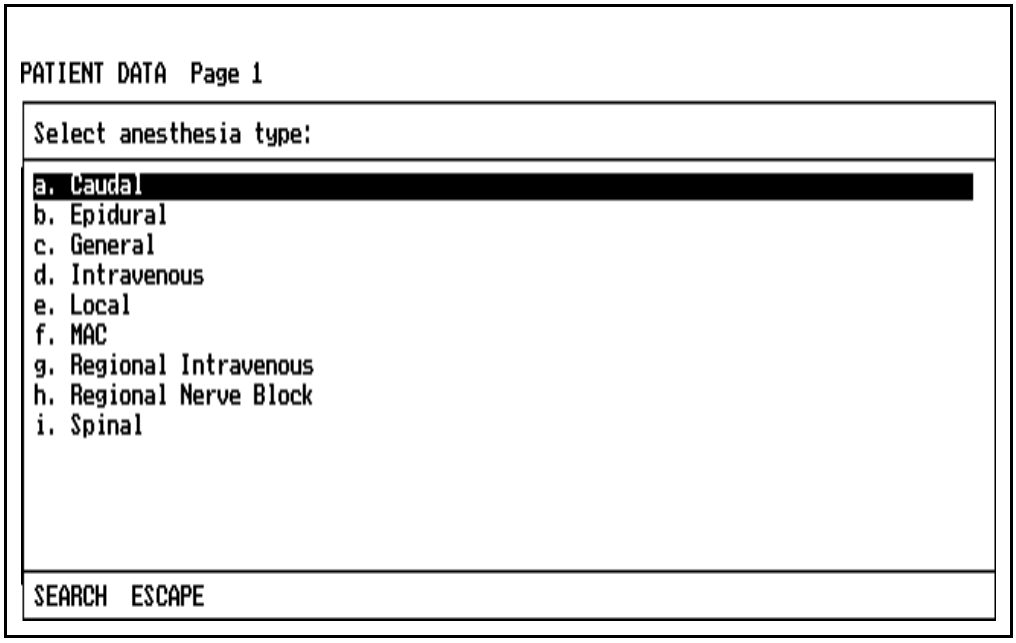
The anesthesia type can be typed in from the keyboard or entered from a pop-up menu. The content of the anesthesia type pop-up menu is site-configurable. If no site-configured anesthesia type list exists, a default menu will appear.

To make a selection from the pop-up menu:

1. In the Patient Data screen, move the cursor to the cell labeled Anest Type.

2. Press the SELECT ENTRY key or the Datagrip trigger to bring up the menu.

3. Make the desired selection by using the procedures described earlier in this section under **Pop-up Menus.**



Entering Surgeon Names

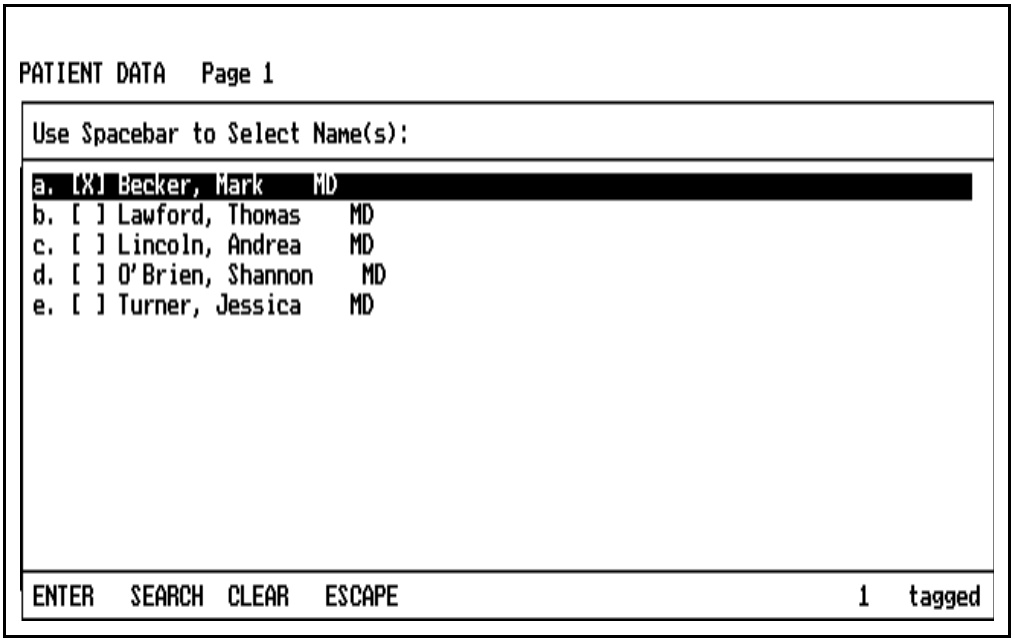
The surgeon names can be typed in on Page 1 of the Patient Data Screen from the keyboard, or entered from a pop-up menu. The content of the surgeon name pop-up menu is site-configurable.

To select a surgeon name from the pop-up menu:

1. On Page 1 of the Patient Data Screen, move the cursor to any of the cells on the line labeled Surgeon 1 or Surgeon 2.

2. Press the SELECT ENTRY key or the Datagrip trigger. This invokes the surgeon name pop-up menu.

The Patient Data screen allows up to two surgeon names to be entered. If there are no existing entries when making the first selection, and Pick List format has been chosen, up to two selections can be made.


PATIENT DATA Page 1
Use Spacebar to Select Name(s):
a. [X] Becker, Mark MD
b. [ ] Lawford, Thomas MD
c. [ ] Lincoln, Andrea MD
d. [ ] O'Brien, Shannon MD
e. [ ] Turner, Jessica MD
ENTER SEARCH CLEAR ESCAPE
1 tagged

If one surgeon name has already been entered in the Patient Data screen and the Surgeon menu is accessed, one selection can be made. If the menu is accessed from a nonblank Surgeon data line, the selected data will replace the existing data.

Entering Anesthesiologist Name

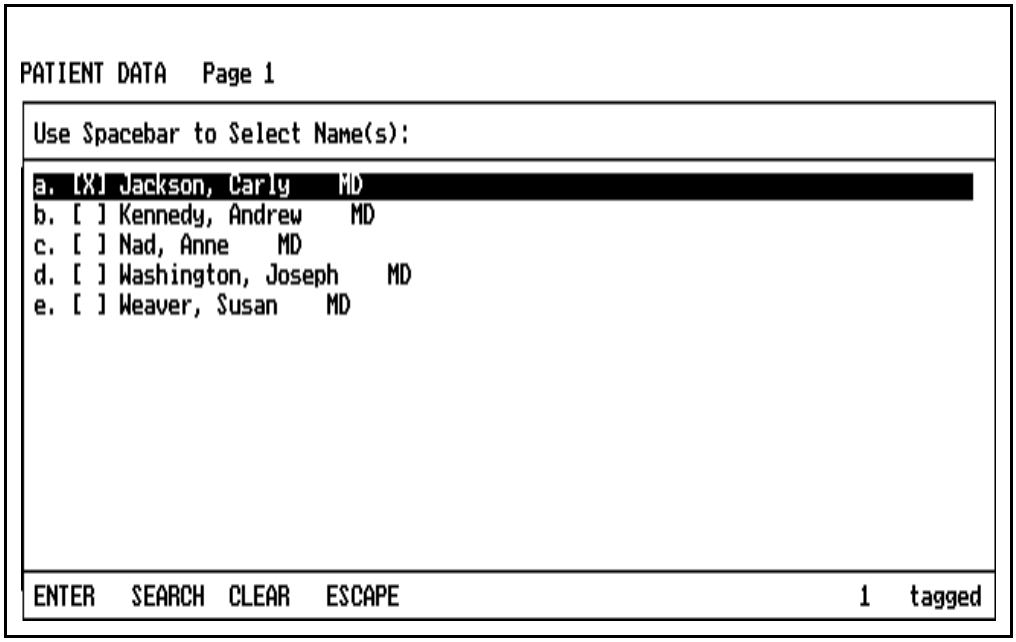
The anesthesiologist name can be typed in on Page 1 of the Patient Data Screen from the keyboard, or entered from a pop-up menu. The content of the anesthesiologist name pop-up menu is site-configurable.

To select an anesthesiologist name from the pop-up menu:

1. In the Patient Data screen, move the cursor to any of the cells in the line labeled Anes'logist.

2. Press the SELECT ENTRY key or the Datagrip trigger. This displays the anesthesiologist name pop-up menu.

3. Make the desired selection by following the procedures described earlier in this section under **Pop-up Menus.**


PATIENT DATA Page 1
Use Spacebar to Select Name(s):
a. [X] Jackson, Carly MD
b. [ ] Kennedy, Andrew MD
c. [ ] Nad, Anne MD
d. [ ] Washington, Joseph MD
e. [ ] Weaver, Susan MD
ENTER SEARCH CLEAR ESCAPE
1 tagged

Entering Anesthetist Names

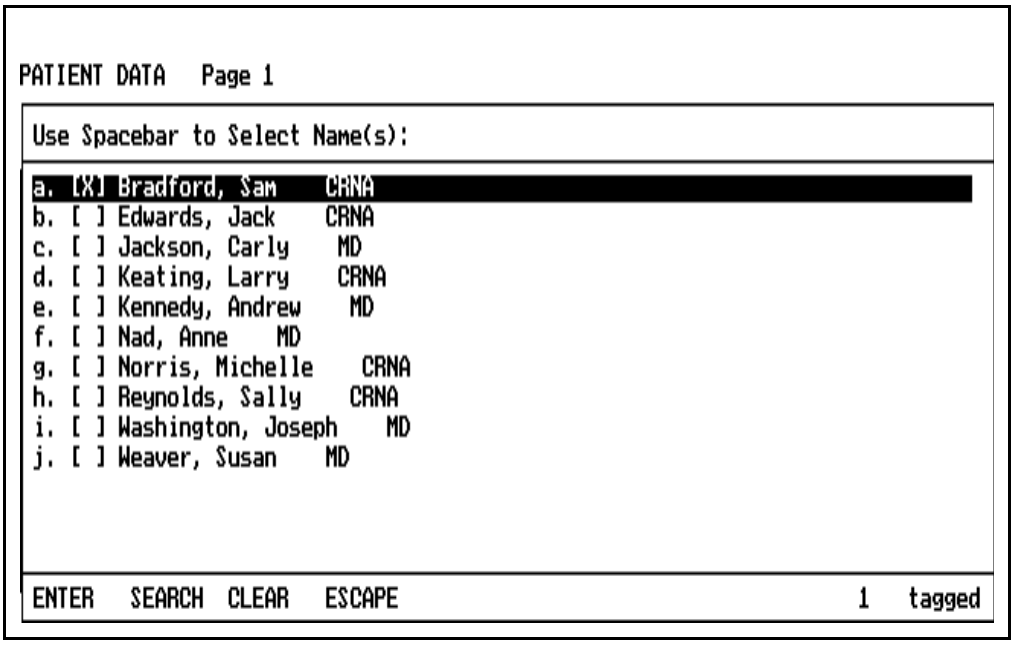
The anesthetist names can be typed in on Page 1 of the Patient Data Screen from the keyboard, or entered from a pop-up menu. The content of the anesthetist name pop-up menu is site-configurable.

To select an anesthetist name from the pop-up menu:

1. On Page 1 of the Patient Data Screen, move the cursor to any of the cells on the line labeled Anest 1 or Anest 2.

2. Press the SELECT ENTRY key or the Datagrip trigger. This invokes the anesthetist name pop-up menu.

The Patient Data screen allows up to two anesthetist names to be entered. If there are no existing entries when making the first selection, and the Pick List format has been selected, up to two selections can be made.


PATIENT DATA Page 1
Use Spacebar to Select Name(s):
a. [X] Bradford, Sam CRNA
b. [ ] Edwards, Jack CRNA
c. [ ] Jackson, Carly MD
d. [ ] Keating, Larry CRNA
e. [ ] Kennedy, Andrew MD
f. [ ] Nad, Anne MD
g. [ ] Norris, Michelle CRNA
h. [ ] Reynolds, Sally CRNA
i. [ ] Washington, Joseph MD
j. [ ] Weaver, Susan MD
ENTER SEARCH CLEAR ESCAPE 1 tagged

If one anesthetist name has already been entered in the Patient Data screen and the Anesthetist menu is accessed, one selection can be made. If the menu is accessed from a nonblank Anesthetist data line, the selected data will replace the existing data.

Entering Insurance Names

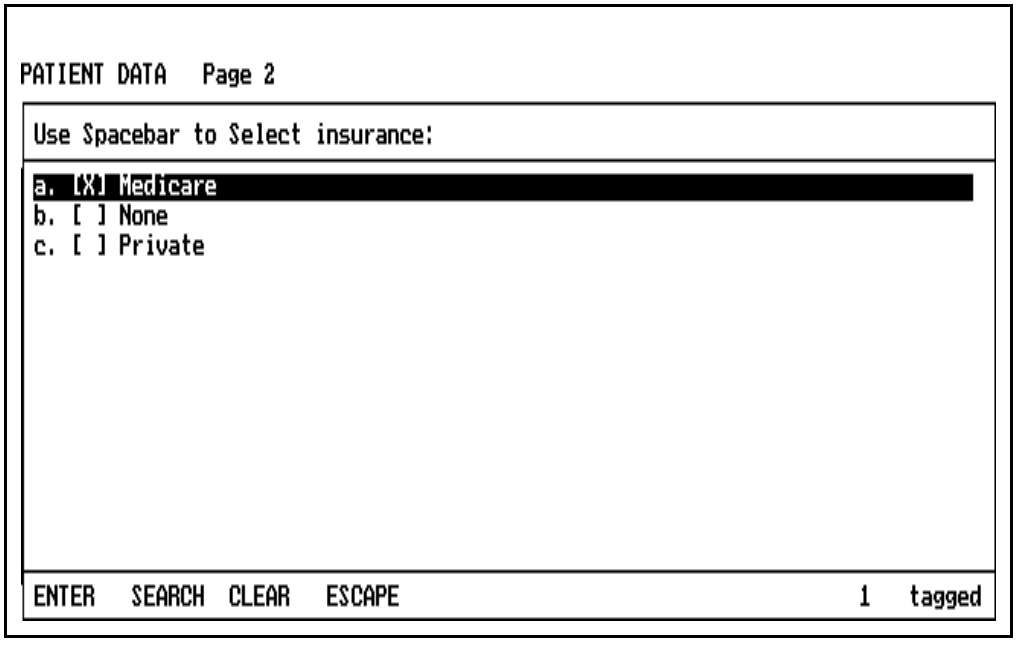
The insurance names can be typed in on Page 2 of the Patient Data screen from the keyboard, or entered from a pop-up menu. The content of the insurance pop-up menu is site-configurable. If no site-configured insurance list exists, a default menu will appear.

To select an insurance name from the pop-up menu:

1. On Page 2 of the Patient Data screen, set the cursor to either of the fields labeled Insurance.

2. Press the SELECT ENTRY key or the Datagrip trigger. This invokes the insurance pop-up menu.

The Patient Data screen allows up to two insurance names to be entered. If there are no existing insurance entries when making a selection, and the Pick List format has been selected, up to two selections can be made.



If one insurance name has already been entered and the insurance menu is accessed, one selection can be made. If the menu is accessed from a nonblank insurance cell, the selected data will replace the existing data.

Editing Data

The Edit Mode allows editing of selected cells in the Patient Data screen. You can edit any cell except Sex, DOB, Ht, Wt, and Age fields or a blank field. Refer to **General Operation,** Edit Mode for use of the edit window.

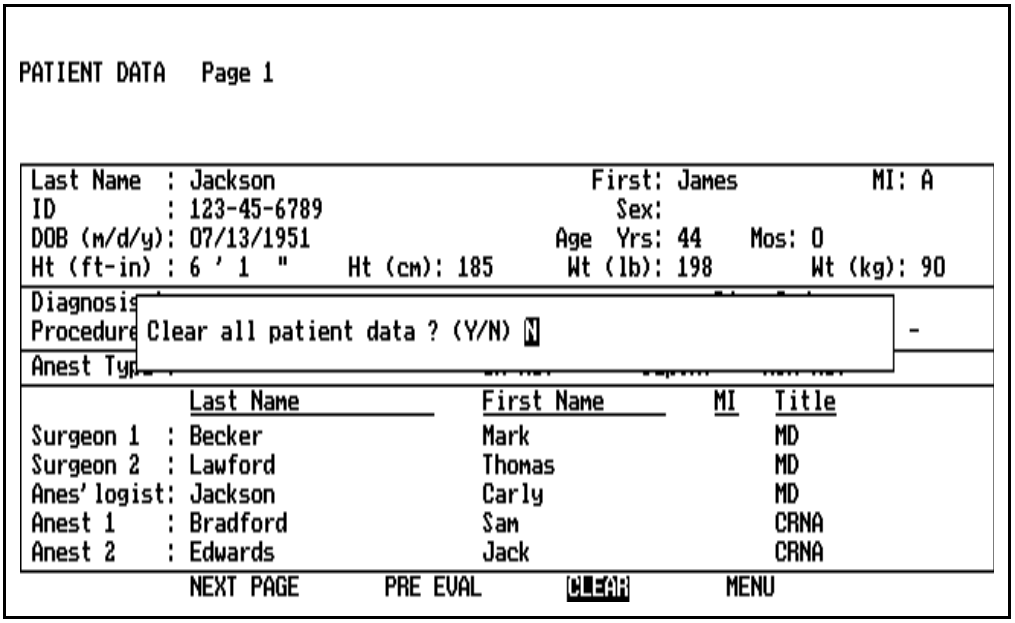
Viewing Pre-Anesthesia Evaluation data

To view the Pre-Anesthesia Evaluation data, set the cursor on PRE EVAL and press ENTER or the Datagrip trigger. This will bring up the Pre-Anesthesia Evaluation screen. For more information on the Pre-Anesthesia Evaluation screen, see the **Pre-Anesthesia Evaluation screen** section of this manual.

Clearing All Patient Data

To delete **all** entries in the Patient Data Screen, set the cursor on CLEAR and press ENTER or the Datagrip trigger. A prompt appears on the screen to confirm the deletion.

NOTE: The DELETE ENTRY key is not active in the Patient Data Screen.


PATIENT DATA Page 1
Last Name : Jackson First: James MI: A
ID : 123-45-6789 Sex:
DOB (m/d/y): 07/13/1951 Age Yrs: 44 Mos: 0
Ht (ft-in) : 6 ' 1 " Ht (cm): 185 Wt (lb): 198 Wt (kg): 90
Clear all patient data ? (Y/N) N
Last Name First Name MI Title
Surgeon 1 : Becker Mark MD
Surgeon 2 : Lawford Thomas MD
Anes'logist: Jackson Carly MD
Anest 1 : Bradford Sam CRNA
Anest 2 : Edwards Jack CRNA
NEXT PAGE PRE EVAL CLEAR MENU

- To clear all patient data, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger. A confirmation prompt [Are you sure? (Y/N)] appears; respond accordingly.

- To cancel the Clear request, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

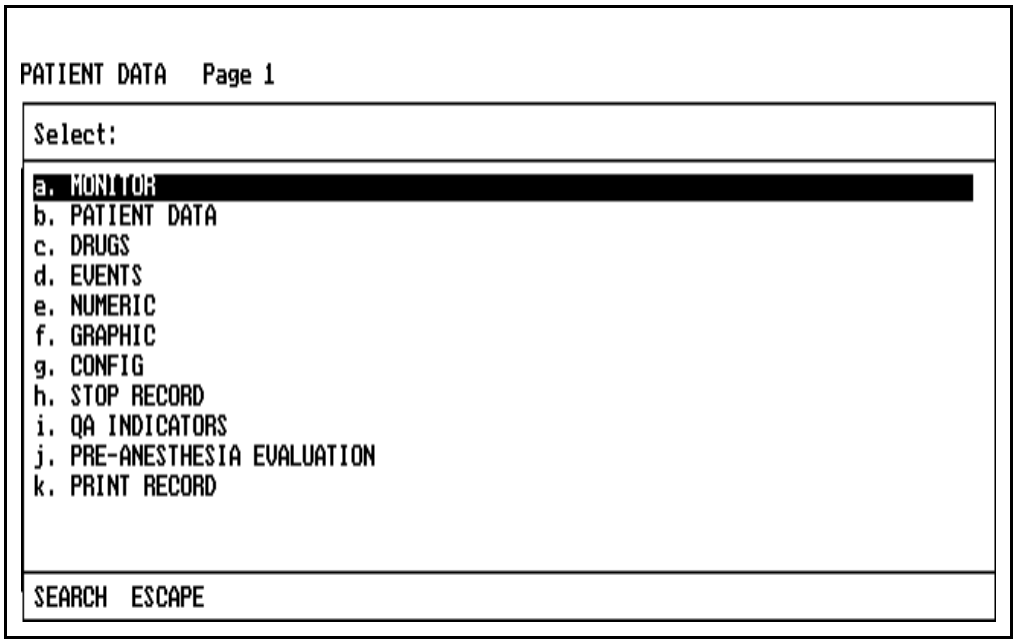
If you do not respond within 30 seconds, no data is cleared, and the prompt is removed from the screen.

Displaying the O.R. Data Manager Screen Menu

To display the O. R. Data Manager screen menu:

1. Move the cursor to the MENU button at the bottom of either page of the Patient Data screen.

2. Press the Datagrip trigger or the SELECT ENTRY key to bring up the menu.



This menu allows entry into other screens.

Make the desired selection by using the procedures described earlier in this section under **Pop-up Menus.**

Exiting the Screen

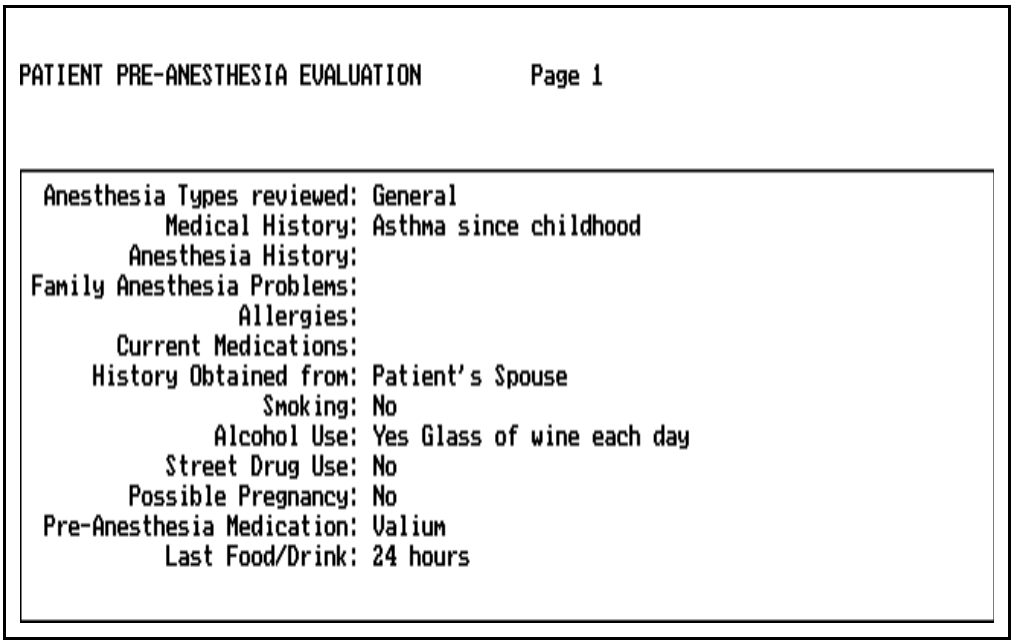
To exit the Patient Data screen, press any of the other Screen keys, or use the Datagrip to select any other option from the O.R. Data Manager screen menu.

Pre-Anesthesia Evaluation Screen

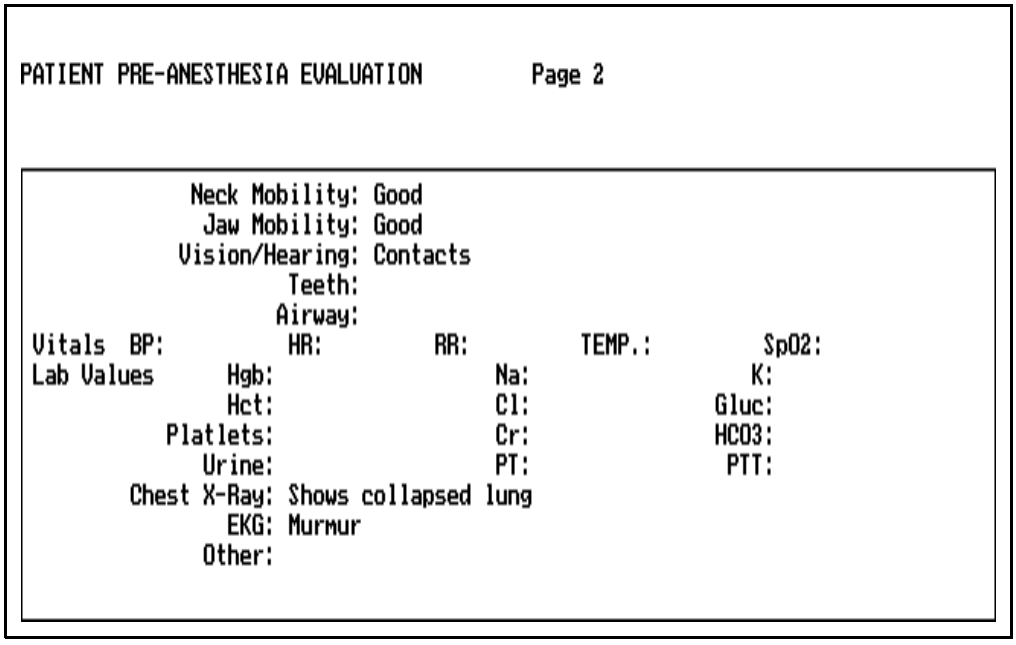
The Pre-Anesthesia Evaluation screen is used to view the data entered in the PC Prep/View Pre-Anesthesia Evaluation screen prior to the start of the case. The Pre-Anesthesia Evaluation data can not be modified in any way on the O.R. Data Manager; it is available for viewing only. For more information on pre-anesthesia evaluation data, see the *PC Prep/View Operator's Manual*.

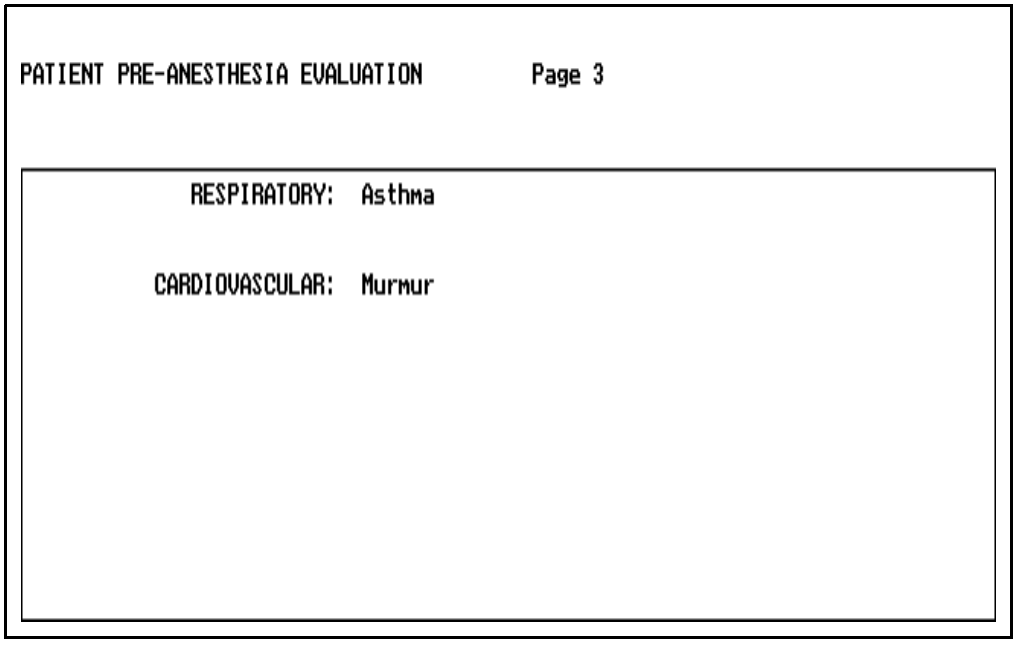
Selecting the Screen

The Pre-Anesthesia Evaluation screen can be selected from the O.R. Data Manager screen menu by typing its key letter or highlighting PRE-ANESTHESIA EVALUATION and pressing the ENTER key or the Datagrip trigger. In addition, the Pre-Anesthesia Evaluation screen can also be selected from the Patient Data screen, or it can be selected from any screen by pressing the key combination ALT-E.



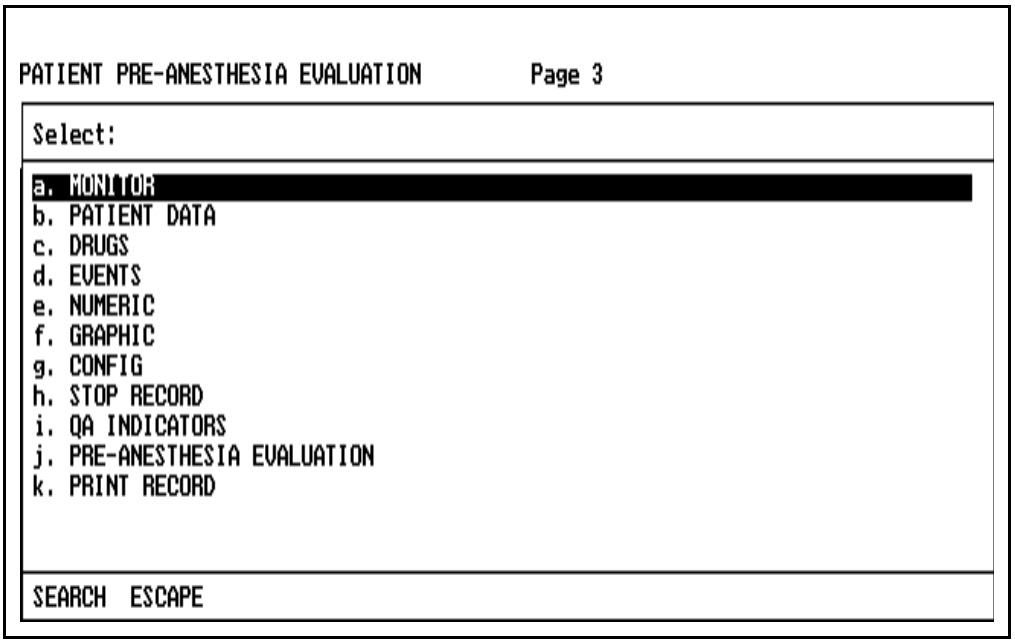
Use the PAGE and ↑↓ arrow keys to move from page to page of the pre-anesthesia evaluation screen.


PATIENT PRE-ANESTHESIA EVALUATION Page 2
Neck Mobility: Good
Jaw Mobility: Good
Vision/Hearing: Contacts
Teeth:
Airway:
Vitals BP: HR: RR: TEMP.: SpO2:
Lab Values Hgb: Na: K:
Hct: Cl: Gluc:
Platlets: Cr: HCO3:
Urine: PT: PTT:
Chest X-Ray: Shows collapsed lung
EKG: Murmur
Other:


PATIENT PRE-ANESTHESIA EVALUATION Page 3
RESPIRATORY: Asthma
CARDIOVASCULAR: Murmur

Displaying the O.R. Data Manager Screen Menu

To display the O.R. Data Manager screen menu, press the SELECT ENTRY key or the Datagrip trigger.



This menu allows entry into other screens, and the STOP RECORD option allows you to stop recording. Make the desired selection using the procedures described earlier in this section under **General Operation** and **Pop-up Menus**.

Exiting the Screen

To exit the Pre-Anesthesia Evaluation screen, press any of the other screen keys, or use the Datagrip to select any other option from the O.R. Data Manager screen menu.

Drug Administration Screen

The Drug Administration screen is used to enter, edit, and view the record of the drugs administered to the patient. The screen displays a list that shows the sequence number, time, drug name, dosage, units of measure, route of administration, and total dosage for each drug entered.

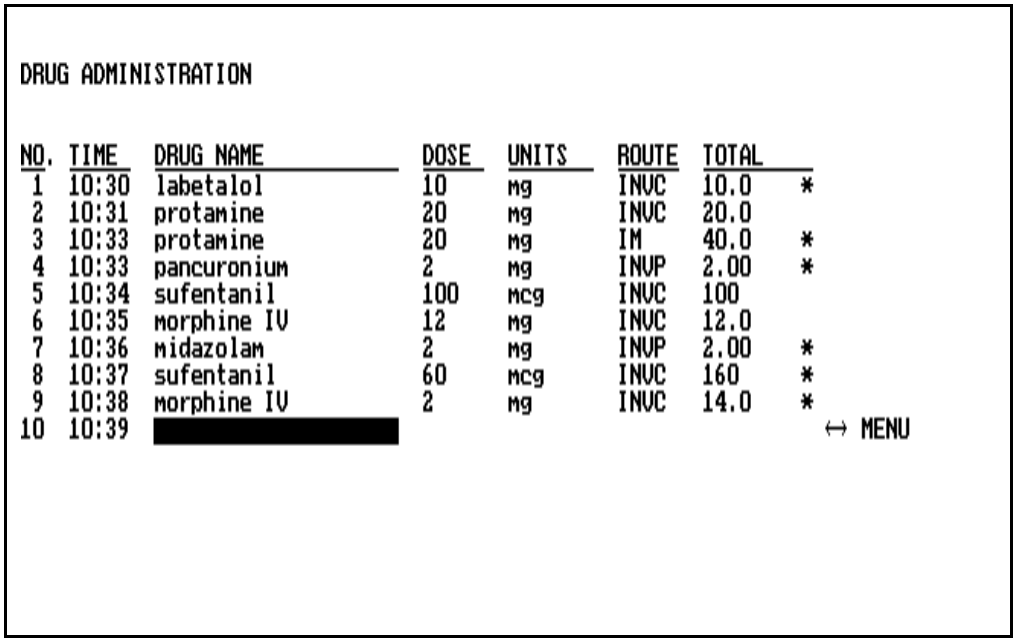
Drug Administration information is cleared from memory at the start of a case.

Selecting the Screen

To enter the Drug Administration screen, press the DRUGS key, or use the Datagrip to select DRUGS from the O.R. Data Manager screen menu.

When the Drug Administration screen is displayed, the cursor appears under the DRUG NAME column in the blank cell below the last entry, unless the last entry is STAT DRUG. If the last entry is STAT DRUG, the cursor appears on that line.

The arrow symbol (either ↔ or ↕) at the right of the screen indicates the direction the cursor will move when you turn the Datagrip thumbwheel. The ↔ indicator means you can move the cursor left and right, while the ↕ indicator means you can move the cursor up and down. When in vertical mode, the entire line is highlighted to aid readability. To switch between horizontal and vertical movement, position the cursor on the direction indicator, and press the Datagrip trigger or the SELECT ENTRY key.


DRUG ADMINISTRATION
NO. TIME DRUG NAME DOSE UNITS ROUTE TOTAL
1 10:30 labetalol 10 mg INVC 10.0 *
2 10:31 protamine 20 mg INVC 20.0
3 10:33 protamine 20 mg IM 40.0 *
4 10:33 pancuronium 2 mg INVP 2.00 *
5 10:34 sufentanil 100 mcg INVC 100
6 10:35 morphine IV 12 mg INVC 12.0
7 10:36 midazolam 2 mg INVP 2.00 *
8 10:37 sufentanil 60 mcg INVC 160 *
9 10:38 morphine IV 2 mg INVC 14.0 *
10 10:39
↔ MENU

Entering/Editing Data

The sequence number is automatically placed in the NO. column. Sequence numbers cannot be edited.

The current time is automatically placed in the TIME column. In the blank set of cells (at the bottom), the time is displayed and continually updated until you make an entry. When you make an entry, the current time automatically becomes the time of the entry. The time can be changed for any entry by moving the cursor into the hour and minute columns and typing the new time. You can also change the time by pressing the SELECT ENTRY key or the Datagrip trigger when in the hour and minute columns. A box will appear around the current time entry. You can then use the arrow keys or the Datagrip thumbwheel to change the time entries by one-minute increments.

If a time is entered that seems inconsistent with the rest of the data, the message "Suspicious Entry Time!!" appears on the screen. This message is displayed if the time entered is more than one hour before recording was started, or more than 15 hours after that time.

If the time for any drug entry is altered, the change is reflected on both the Drug Administration screen and the Graphic History screen.

The phrase STAT DRUG may appear in the DRUG NAME column. If it does, it indicates that the STAT DRUG key was pressed during the case. You can edit a STAT DRUG entry to show the actual drug administered at that time.

If any edited data alters the time sequence, the entries will initially appear to be out of sequence. To redisplay the entries in proper time sequence, exit the Drug Administration screen, then re-enter it.

The TOTAL column shows the total administered dosage for each drug and is updated automatically. An asterisk to the right of the TOTAL column indicates the most recent total for each drug.

NOTE: No total will be shown if all units of measure are not the same for a drug name.

You can enter a maximum of 98 entries in the Drug Administration Screen.

Selecting Drugs From the Drug Template

As an alternative to typing drug names, you can select drugs from the Drug Template. If no Drug Template was specified, the O.R. Data Manager loads a default drug template from its hard drive.

For instructions on creating and editing case-specific templates, see the *PC Prep/View Operator's Manual*.

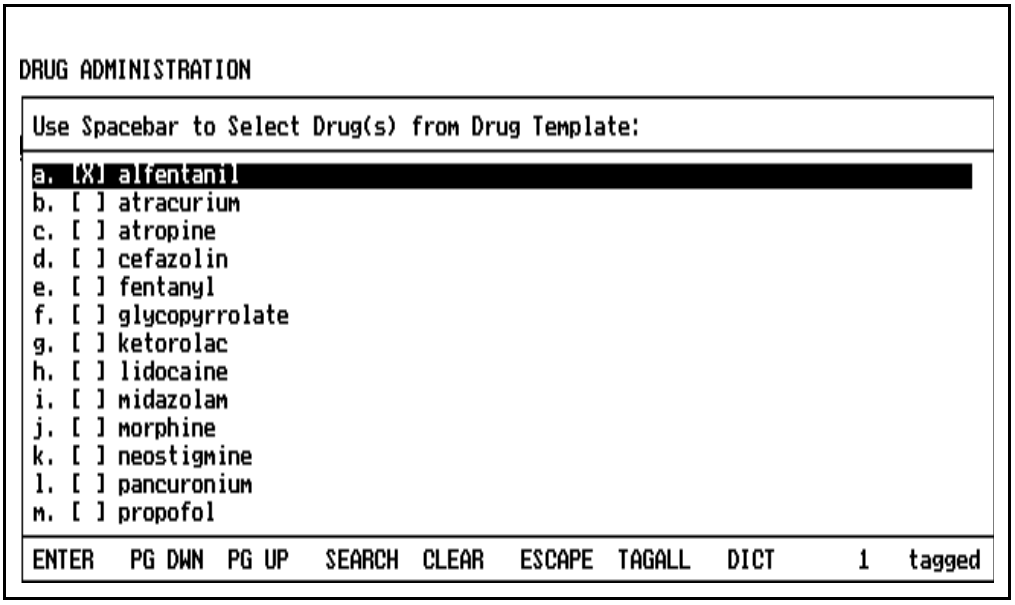
To select a drug from the Drug Template:

1. In the Drug Administration screen, move the cursor to the desired cell in the DRUG NAME column.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the Drug pop-up menu, which contains the list of drug names stored in the template.

If the system is configured in the Single Entry format (see **System Configuration**), the pop-up menu will always appear in the Single Entry format.

If the Pick List format was chosen in the configuration options, the Drug pop-up menu is always displayed in the Pick List format.


DRUG ADMINISTRATION
Use Spacebar to Select Drug(s) from Drug Template:
a. [X] alfentanil
b. [ ] atracurium
c. [ ] atropine
d. [ ] cefazolin
e. [ ] fentanyl
f. [ ] glycopyrrolate
g. [ ] ketorolac
h. [ ] lidocaine
i. [ ] midazolam
j. [ ] morphine
k. [ ] neostigmine
l. [ ] pancuronium
m. [ ] propofol
ENTER PG DWN PG UP SEARCH CLEAR ESCAPE TAGALL DICT 1 tagged

Select drugs using the procedures described earlier in this section under **General Operation** and **Pop-up Menus**.

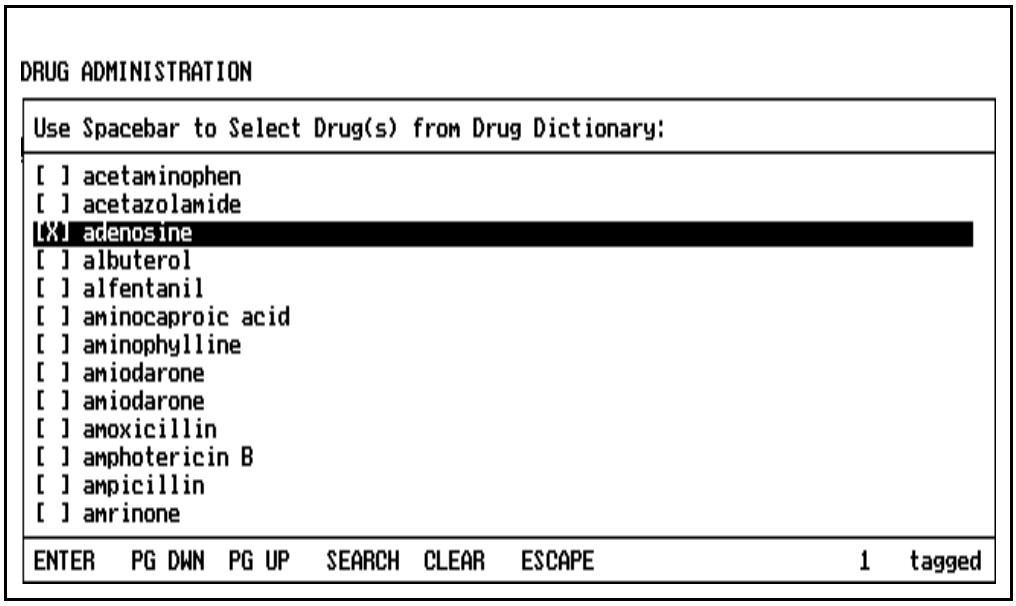
If Units and/or Routes were specified when the drug template was created, they will automatically be entered when the drug is selected.

Selecting Drugs From the Drug Dictionary

The Drug Dictionary, which is a list of commonly used drugs and fluids, is accessed by making the DICT selection at the bottom of the drug template menu. The content of the Drug Dictionary is site-configurable. If no site-configured Drug Dictionary exists, a default list will appear.

Lists are configured using the PC Prep/View software program and are later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

When you select the Drug Dictionary option, a pop-up window appears listing all the names in the Drug Dictionary.



If the system is configured in the Single Entry format (see **System Configuration**), the pop-up menu will always appear in the Single Entry format. If the Pick List format was chosen in the configuration options, the Drug Dictionary display will always be in the Pick List format.

Select drugs using the procedures described earlier in this section under **General Operation** and **Pop-up Menus**.

The units specified in the Drug Dictionary will automatically be entered when the drug is selected.

Auto Drug Dictionary Option

If the Auto Drug Dictionary option is enabled on the Configuration Options subscreen (see **System Configuration**), the O.R. Data Manager will complete the drug name automatically as soon as the user enters a string (from the keyboard) that uniquely identifies a drug in the Drug Dictionary.

If the drug name is in the drug template, the units and route specified in the drug template will also be automatically entered. Otherwise, the units from the Drug Dictionary will be automatically entered. (The Drug Dictionary does not contain routes.)

This feature is useful for ensuring that drug names are spelled correctly and are consistent from record to record.

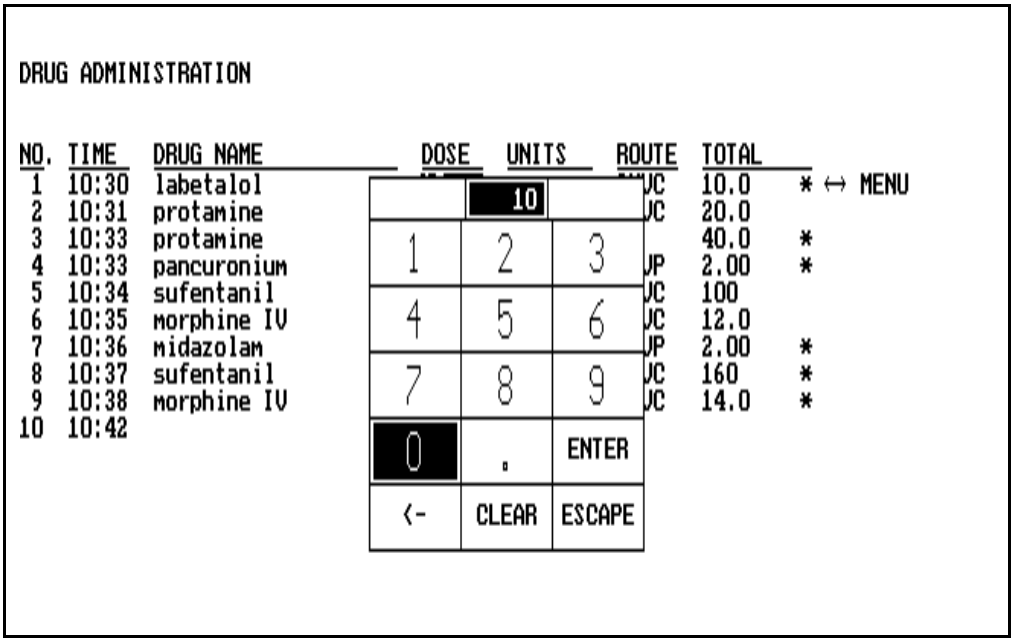
Entering/Editing Drug Dosage

You can enter dosage via the keyboard simply by typing it in, or you can select it from a pop-up numeric keypad.

To enter the dosage using the pop-up numeric keypad:

1. Move the cursor to the desired drug dose cell.

2. Press the Datagrip trigger or the SELECT ENTRY key to display a pop-up numeric keypad used to enter dosage amounts.


DRUG ADMINISTRATION
NO. TIME DRUG NAME DOSE UNITS ROUTE TOTAL
1 10:30 labetalol VC 10.0 * ↔ MENU
2 10:31 protamine VC 20.0
3 10:33 protamine 40.0 *
4 10:33 pancuronium VP 2.00 *
5 10:34 sufentanil VC 100
6 10:35 morphine IV VC 12.0
7 10:36 midazolam VP 2.00 *
8 10:37 sufentanil VC 160 *
9 10:38 morphine IV VC 14.0 *
10 10:42
10
1 2 3
4 5 6
7 8 9
0 . ENTER
<- CLEAR ESCAPE

3. Highlight a number using the Datagrip thumbwheel or the cursor keys, and press the Datagrip trigger or the ENTER key. The selected number will appear in the highlighted box at the top of the numeric keypad.

4. Continue entering numbers in this manner until the proper dosage is displayed. Then highlight the box in the keypad marked ENTER, and press the Datagrip trigger or the ENTER key. The specified dosage is inserted in the DOSE cell, and the pop-up numeric keypad is removed from the screen.

If you make a mistake while selecting numbers from the keypad, use the backspace option in the table (←) to delete the last number selected, or the CLEAR option to remove all numbers selected thus far. The ESCAPE option removes the numeric keypad from the screen without making any changes.

Selecting Units of Measure

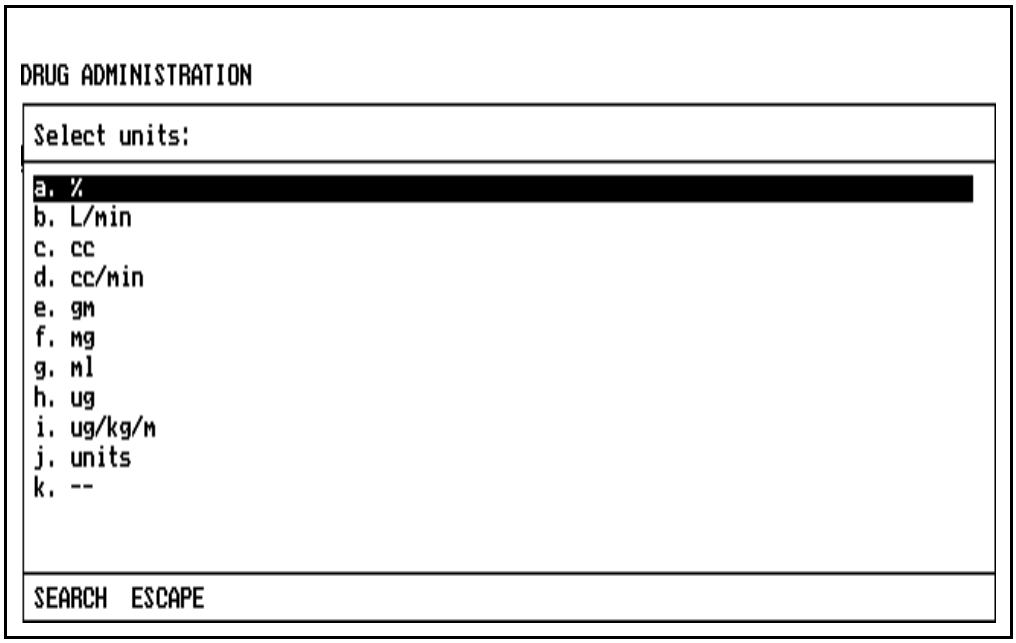
You can enter units of measure directly from the keyboard or from a pop-up menu. The content of the units pop-up menu is site-configurable. If no site-configured units list exists, a default menu will appear.

To select units of measure from the pop-up menu:

1. Move the cursor to the desired cell in the UNITS column.

2. Press the SELECT ENTRY key or the Datagrip trigger to invoke the pop-up menu, which contains the list of units of measure.

3. Make the desired selection according to the procedures described earlier in this section under **General Operation** and **Pop-up Menus**.



Selecting Route

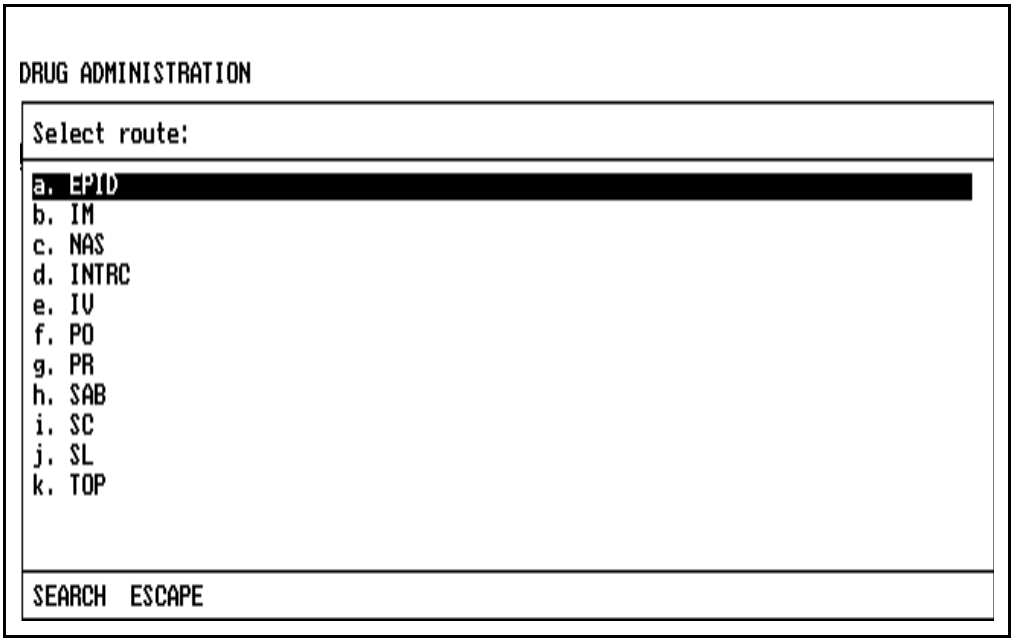
The route of administration for each drug can be entered from the keyboard, or it can be selected from a pop-up menu when the cursor is positioned on the ROUTE column. The contents of the routes pop-up menu is site-configurable. If no site-configured routes list exists, a default menu will appear.

To make the selection:

1. Move the cursor to the desired cell in the ROUTE column.

2. Press the SELECT ENTRY key or the Datagrip trigger to invoke the pop-up menu, which contains the route list.

3. Make the desired selection according to the procedures described earlier in this section under **General Operation** and **Pop-up Menus**.



Section 5 - Operation
O.R. Data Manager

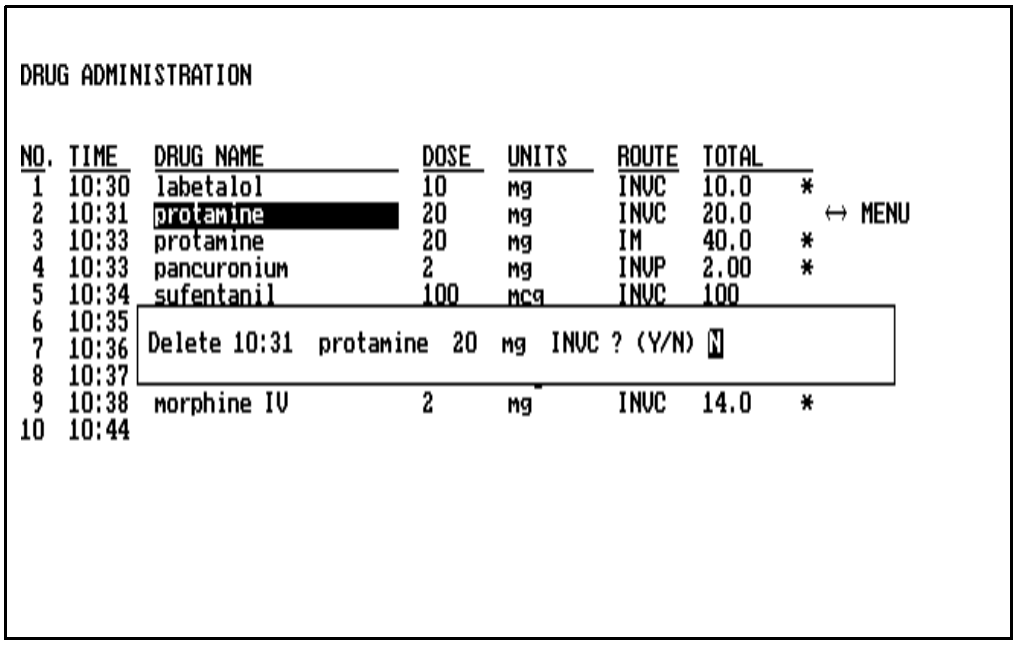
Editing Data

The Edit Mode allows editing of selected cells in the Drug Administration screen. You can edit any cell except the Total fields, time fields, sequence No. or blank fields. Refer to **General Operation,** Edit Mode for use of the edit window.

Deleting an Entry

To delete an entry:

1. Move the cursor to any cell in the line to be deleted.
2. Press DELETE ENTRY. A prompt appears on the screen to confirm the deletion.


DRUG ADMINISTRATION
NO. TIME DRUG NAME DOSE UNITS ROUTE TOTAL
1 10:30 labetalol 10 mg INVC 10.0 *
2 10:31 protamine 20 mg INVC 20.0 ↔ MENU
3 10:33 protamine 20 mg IM 40.0 *
4 10:33 pancuronium 2 mg INVP 2.00 *
5 10:34 sufentanil 100 mcg INVC 100
6 10:35
7 10:36
8 10:37
9 10:38 morphine IV 2 mg INVC 14.0 *
10 10:44
Delete 10:31 protamine 20 mg INVC ? (Y/N) N

- To delete the data from the screen and the disk, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- To cancel the DELETE ENTRY request, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

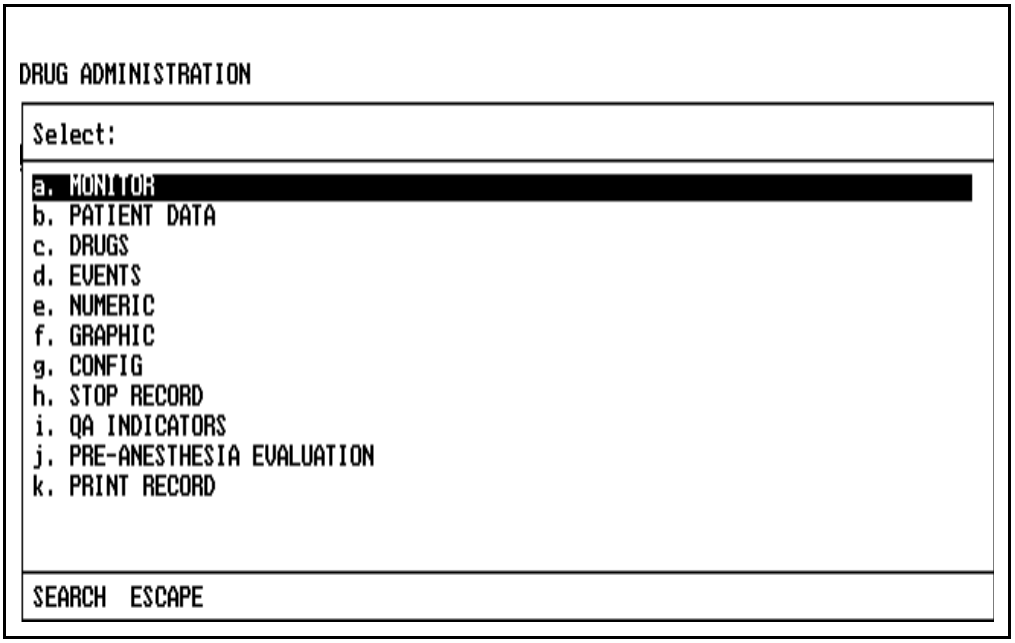
If you do not respond within 30 seconds, nothing is deleted and the message is removed from the screen.

Displaying the O.R. Data Manager Screen Menu

To display the O. R. Data Manager screen menu:

1. Move the cursor to the MENU button at the right of the Drug Administration screen.

2. Press the Datagrip trigger or the SELECT ENTRY key to bring up the menu.



This menu allows entry into other screens, and the STOP RECORD option allows you to stop recording.

Make the desired selection using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

Exiting the Screen

To exit the Drug Administration screen, press any of the other Screen keys, or use the Datagrip to select any other option from the O.R. Data Manager screen menu.

Section 5 - Operation
O.R. Data Manager

O.R. Event Record Screen

The O.R. Event Record screen is used to enter, edit, and view the record of events. Each entry shows the sequence number, time of the event, and a description of the event.

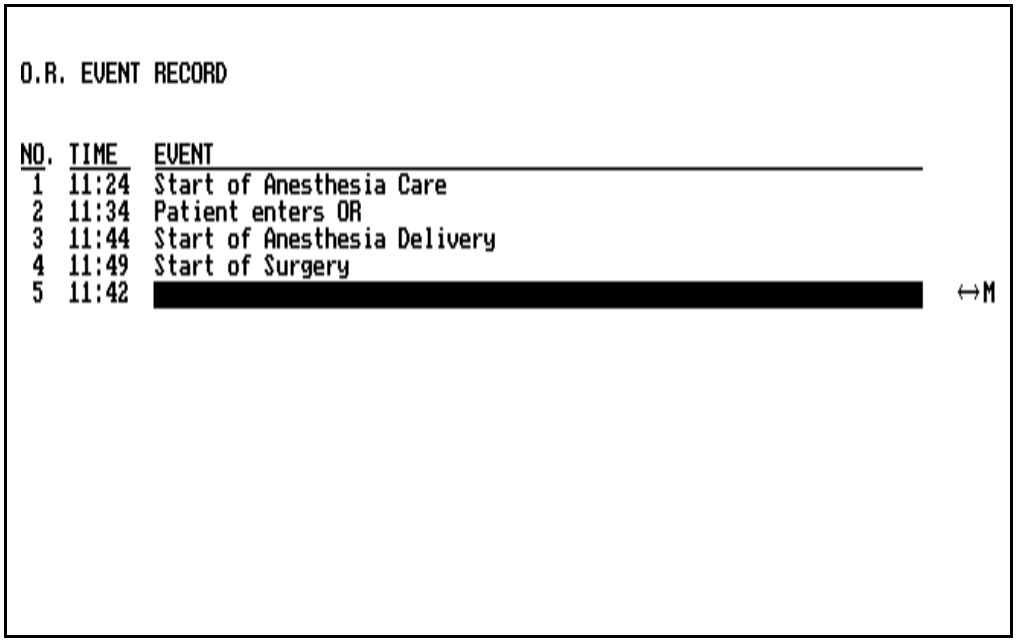
Event information is cleared from memory at the start of a case.

Selecting the Screen

To enter the O.R. Event Record screen, press the EVENTS key, or use the Datagrip to select EVENTS from the O.R. Data Manager screen menu.

When the screen is displayed, the cursor appears under the EVENT column in the blank cell below the last entry, unless the last entry is STAT EVENT or ARTIFACT. If the last entry is STAT EVENT or ARTIFACT, the cursor will appear on that line.

The arrow symbol (either ↔ or ↕) at the right of the screen indicates the direction the cursor will move when you turn the Datagrip thumbwheel. The ↔ indicator means you can move the cursor left and right, while the ↕ indicator means you can move the cursor up and down. When in vertical mode, the entire line is highlighted to aid readability. To switch between horizontal and vertical movement, position the cursor on the direction indicator, and press the Datagrip trigger or the SELECT ENTRY key.



Entering/Editing Data

The sequence number is automatically placed in the NO. column. Sequence numbers cannot be edited.

The current time is automatically placed in the TIME column. In the blank set of cells (at the bottom), the time is displayed and continually updated until you enter an event. When you make an entry, the current time automatically becomes the time of the entry. The time can be changed for any entry by moving the cursor into the hour and minute columns and typing the new time. You can also change the time by pressing the SELECT ENTRY key or the Datagrip trigger when in the hour and minute columns. A box will appear around the current time entry. You can then use the arrow keys or the Datagrip thumbwheel to change the time entries by one-minute increments.

If a time entered for an event seems inconsistent with the rest of the data, the message "Suspicious Entry Time!!" appears on the screen. This message is displayed if the time entered is more than one hour before recording was started, or more than 15 hours after that time.

If the time for any event entry is altered, the change is reflected on both the O.R. Event Record screen and the Graphic History screen.

The phrase STAT EVENT may appear in the EVENT column. If it does, it indicates that the STAT EVENT key was pressed during the case. You can edit a STAT EVENT entry to show the actual event that occurred at that time.

The word ARTIFACT may also appear in the EVENT column. If it does, it indicates that the ARTIFACT key was pressed during the case. You can edit an ARTIFACT entry to describe the event that occurred at that time. The time entered for an ARTIFACT cannot be before the time that the START/STOP RECORD button was pressed.

If any edited data alters the time sequence, the entries initially appear to be out of sequence. To redisplay the entries in proper time sequence, exit the O.R. Event Record screen, then re-enter it.

Depending upon the system configuration (see **System Configuration**), if a data value is received over VITALINK that exceeds its scale in the Graphic History Screen, an event will be automatically logged in the O.R. Event Record. The event will indicate the time, the variable name, and the value. If you are entering or editing an event when an out-of-bounds value is logged, your entry will be aborted so that the out-of-bounds value can be noted immediately.

You can enter a maximum of 98 events in the O.R. Event Record Screen.

Automatically Entered Events

Certain events can be automatically entered at the start and end of a case at specific offsets (in minutes) from when the START/STOP RECORD button was pressed. For Start Case, these events are:

1. Start of Anesthesia Care
2. Patient enters OR
3. Start of Anesthesia Delivery
4. Start of Surgery

For Stop Case, the events are:

1. End of Anesthesia Care
2. Patient exits OR
3. End of Anesthesia Delivery
4. End of Surgery
5. PACU vitals

The configuration of which events are automatically entered and their time offsets is done through the CliniDAS System Configuration screen. If the user does not configure these events, all of the events will appear on the record with the following offsets:

Event	Offset (minutes)
Start of Anesthesia Care	-10
Patient enters OR	0
Start of Anesthesia Delivery	10
Start of Surgery	15

End of Surgery	-15
End of Anesthesia Delivery	-10
Patient exits OR	0
End of Anesthesia Care	10
PACU vitals	10

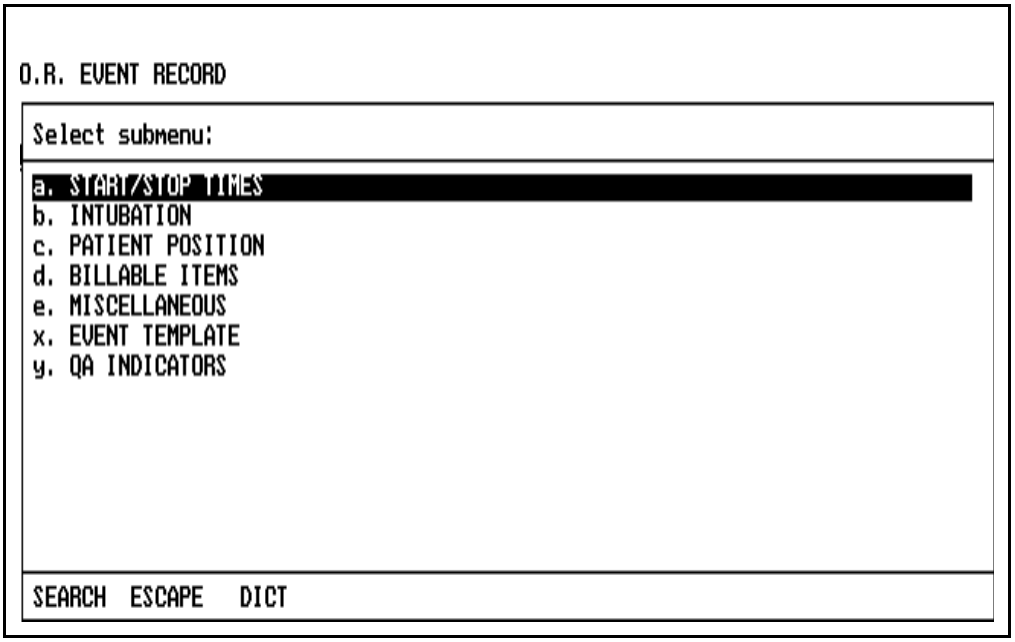
For more information on automatically entered events, see the *CliniDAS Administrator's Guide*.

Selecting Sub-menus From the O.R. EVENT RECORD Pop-Up Menu

As an alternative to typing events, you can select them from a set of submenus that are accessed through the main Event menu shown below.

To display the main Event menu:

1. Move the cursor to the desired cell in the EVENT column.
2. Press the SELECT ENTRY key or the Datagrip trigger. This displays the main Event pop-up menu, which contains a list of submenus.
3. To select a submenu, use the procedures outlined earlier in this section under **Pop-up Menus**.



Event Selection Method (for all submenus)

If the system is configured in the Single Entry format (see **System Configuration**), the submenus will always appear in the Single Entry format.

If the Pick List format was chosen in the configuration options, the Event submenus are always displayed in the Pick List format.

Select events from the submenus using the procedures described earlier in this section under **Pop-up Menus**.

Using the Events Dictionary

The Events Dictionary is accessed by making the DICT selection at the bottom of the main Event menu.

When you select the Events Dictionary option, a pop-up window appears listing all the events from all the submenus.

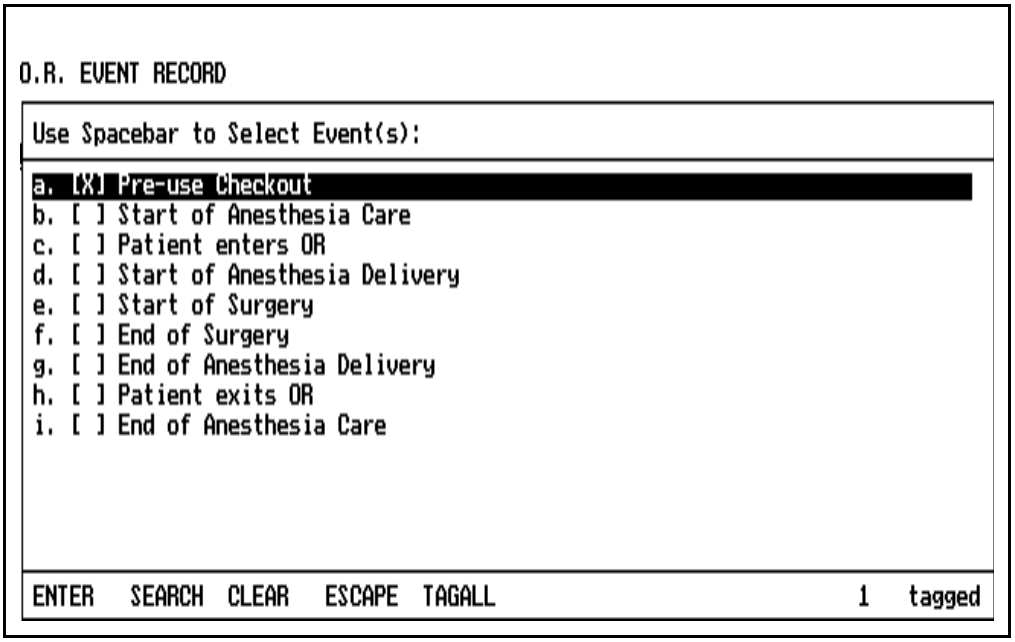
If the system is configured in the Single Entry format (see **System Configuration**), the pop-up menu will always appear in the Single Entry format.

If the Pick List format was chosen in the configuration options, the Events Dictionary display will always be in the Pick List format.

Select events from the Events Dictionary using the procedures described earlier in this section under **Pop-up Menus**.

Selecting From the START/STOP TIMES Submenu

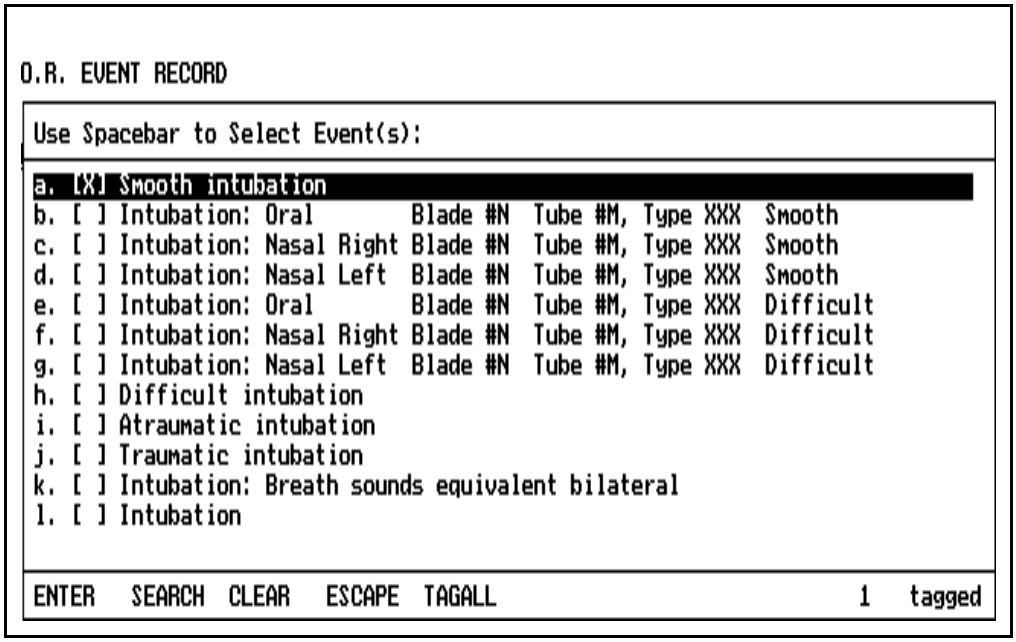
When START/STOP TIMES is selected from the main Event menu, the following submenu appears:


O.R. EVENT RECORD
Use Spacebar to Select Event(s):
a. [X] Pre-use Checkout
b. [ ] Start of Anesthesia Care
c. [ ] Patient enters OR
d. [ ] Start of Anesthesia Delivery
e. [ ] Start of Surgery
f. [ ] End of Surgery
g. [ ] End of Anesthesia Delivery
h. [ ] Patient exits OR
i. [ ] End of Anesthesia Care
ENTER SEARCH CLEAR ESCAPE TAGALL
1 tagged

Select an item using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

Selecting From the INTUBATION Submenu

When INTUBATION is selected from the main Event menu, a user configurable (or default) list appears:


O.R. EVENT RECORD
Use Spacebar to Select Event(s):
a. [X] Smooth intubation
b. [ ] Intubation: Oral Blade #N Tube #M, Type XXX Smooth
c. [ ] Intubation: Nasal Right Blade #N Tube #M, Type XXX Smooth
d. [ ] Intubation: Nasal Left Blade #N Tube #M, Type XXX Smooth
e. [ ] Intubation: Oral Blade #N Tube #M, Type XXX Difficult
f. [ ] Intubation: Nasal Right Blade #N Tube #M, Type XXX Difficult
g. [ ] Intubation: Nasal Left Blade #N Tube #M, Type XXX Difficult
h. [ ] Difficult intubation
i. [ ] Atraumatic intubation
j. [ ] Traumatic intubation
k. [ ] Intubation: Breath sounds equivalent bilateral
l. [ ] Intubation
ENTER SEARCH CLEAR ESCAPE TAGALL 1 tagged

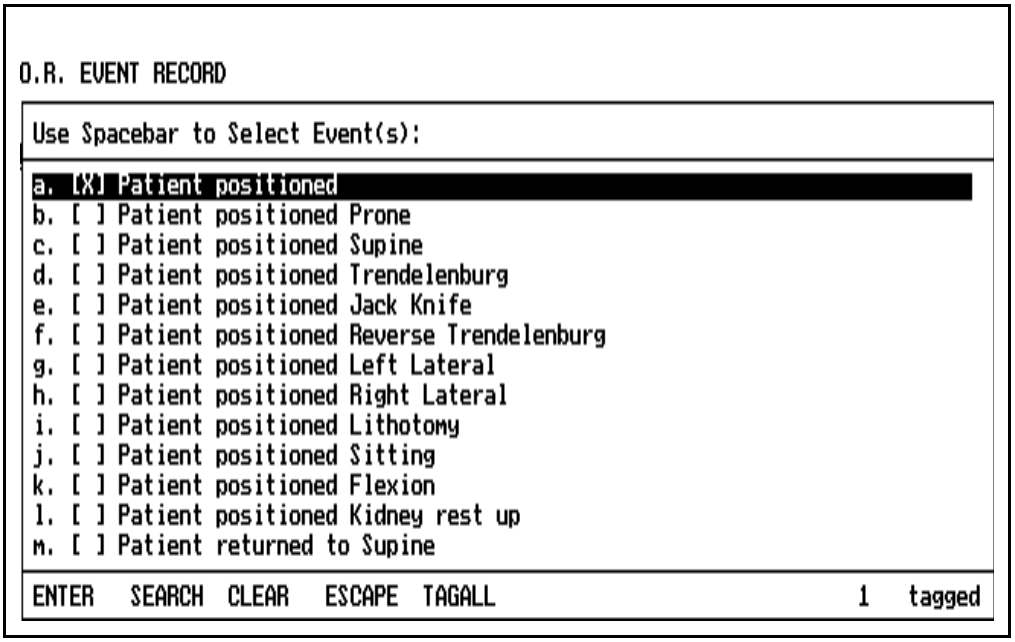
Select an item using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

The content of the submenu is site-configurable. The menu list is configured using the PC Prep/View software program and is later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

If no site-configured INTUBATION list exists, a default menu will appear.

Selecting From the PATIENT POSITION Submenu

When PATIENT POSITION is selected from the main Event menu, a user configurable (or default) list appears:


O.R. EVENT RECORD
Use Spacebar to Select Event(s):
a. [X] Patient positioned
b. [ ] Patient positioned Prone
c. [ ] Patient positioned Supine
d. [ ] Patient positioned Trendelenburg
e. [ ] Patient positioned Jack Knife
f. [ ] Patient positioned Reverse Trendelenburg
g. [ ] Patient positioned Left Lateral
h. [ ] Patient positioned Right Lateral
i. [ ] Patient positioned Lithotomy
j. [ ] Patient positioned Sitting
k. [ ] Patient positioned Flexion
l. [ ] Patient positioned Kidney rest up
m. [ ] Patient returned to Supine
ENTER SEARCH CLEAR ESCAPE TAGALL
1 tagged

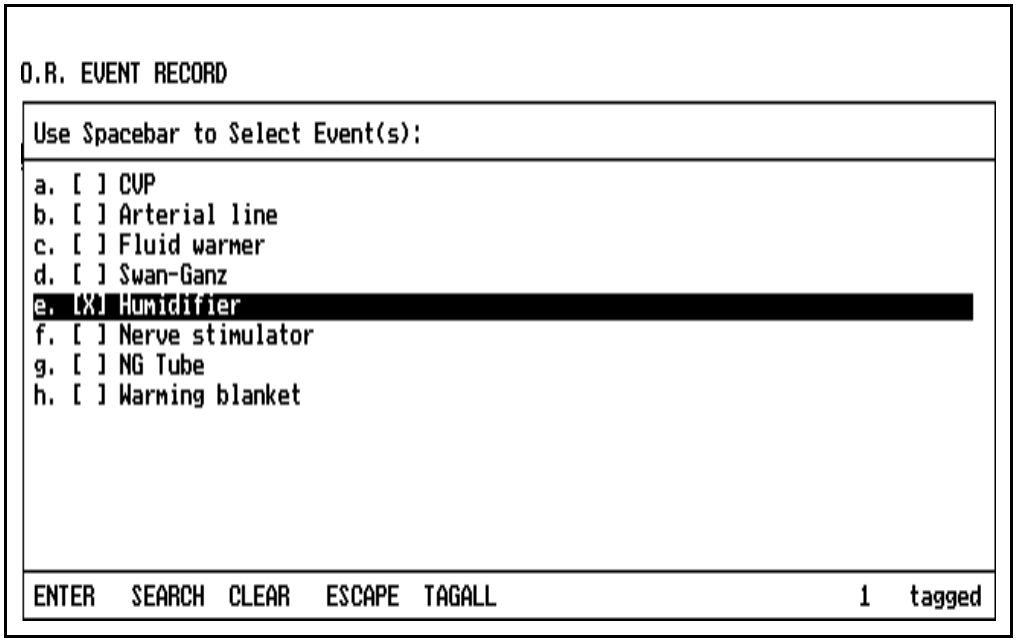
Select an item using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

The content of the submenu is site-configurable. The menu list is configured using the PC Prep/View software program and is later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

If no site-configured PATIENT POSITION list exists, a default menu will appear.

Selecting From the BILLABLE ITEMS Submenu

When BILLABLE ITEMS is selected from the main Event menu, a user configurable (or default) list appears:


O.R. EVENT RECORD
Use Spacebar to Select Event(s):
a. [ ] CVP
b. [ ] Arterial line
c. [ ] Fluid warmer
d. [ ] Swan-Ganz
e. [X] Humidifier
f. [ ] Nerve stimulator
g. [ ] NG Tube
h. [ ] Warming blanket
ENTER SEARCH CLEAR ESCAPE TAGALL
1 tagged

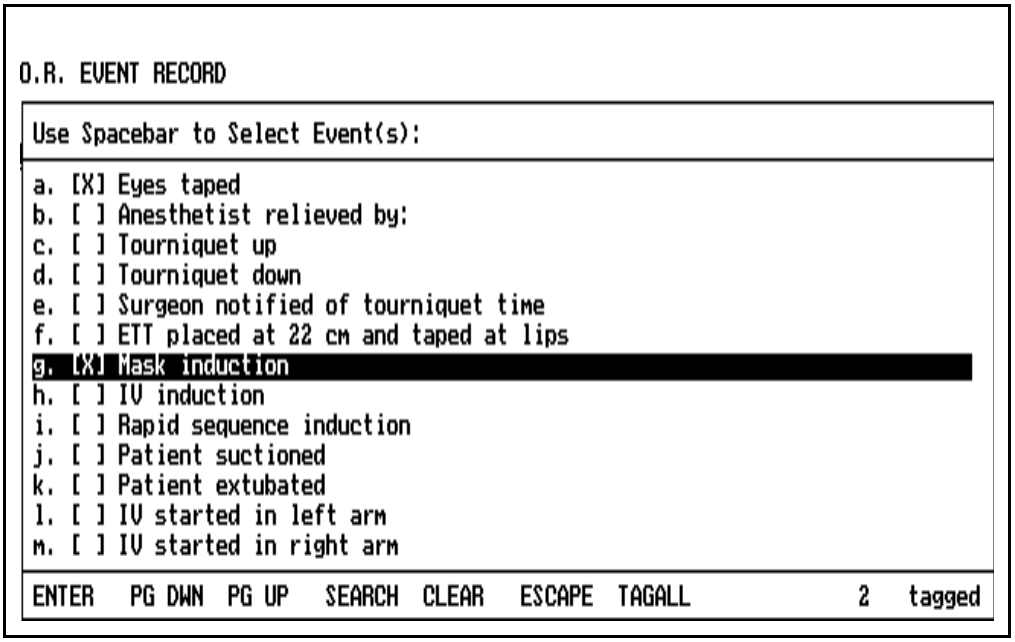
Select an item using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

The content of the submenu is site-configurable. The menu list is configured using the PC Prep/View software program and is later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

If no site-configured BILLABLE ITEMS list exists, a default menu will appear.

Selecting From the MISCELLANEOUS Submenu

When MISCELLANEOUS is selected from the main Event menu, a user configurable (or default) list appears:


O.R. EVENT RECORD
Use Spacebar to Select Event(s):
a. [X] Eyes taped
b. [ ] Anesthetist relieved by:
c. [ ] Tourniquet up
d. [ ] Tourniquet down
e. [ ] Surgeon notified of tourniquet time
f. [ ] ETT placed at 22 cm and taped at lips
g. [X] Mask induction
h. [ ] IV induction
i. [ ] Rapid sequence induction
j. [ ] Patient suctioned
k. [ ] Patient extubated
l. [ ] IV started in left arm
m. [ ] IV started in right arm
ENTER PG DWN PG UP SEARCH CLEAR ESCAPE TAGALL 2 tagged

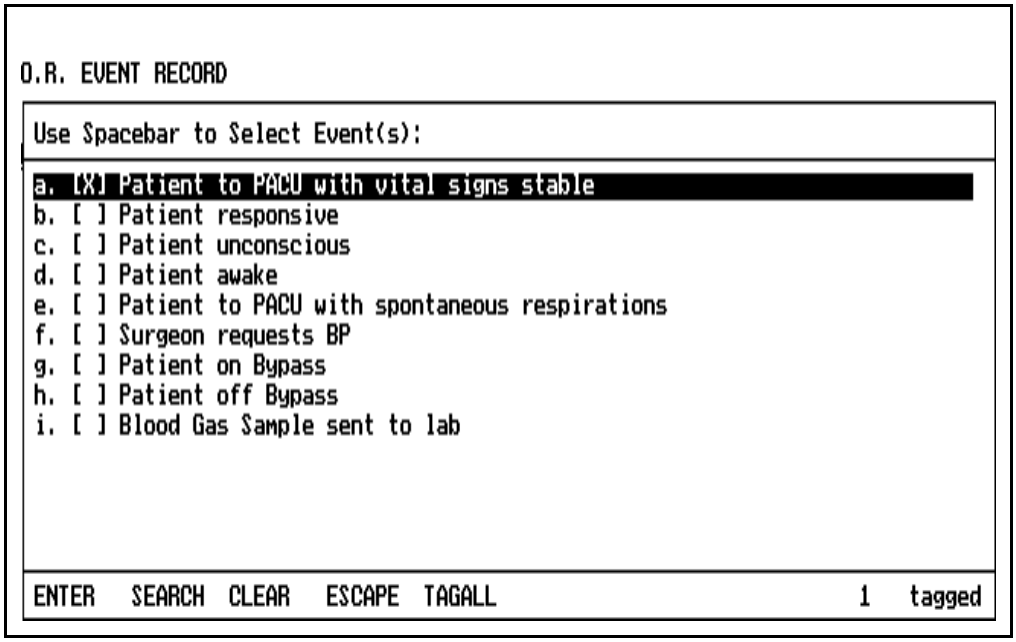
Select an item using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

The content of the submenu is site-configurable. The menu list is configured using the PC Prep/View software program and is later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

If no site-configured MISCELLANEOUS list exists, a default menu will appear.

Selecting From the EVENT TEMPLATE Sub-menu

When EVENT TEMPLATE is selected from the main Event menu, a template selected by the user appears:


O.R. EVENT RECORD
Use Spacebar to Select Event(s):
a. [X] Patient to PACU with vital signs stable
b. [ ] Patient responsive
c. [ ] Patient unconscious
d. [ ] Patient awake
e. [ ] Patient to PACU with spontaneous respirations
f. [ ] Surgeon requests BP
g. [ ] Patient on Bypass
h. [ ] Patient off Bypass
i. [ ] Blood Gas Sample sent to lab
ENTER SEARCH CLEAR ESCAPE TAGALL
1 tagged

Select an item using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

The O.R. Data Manager loads the Event Template selected by the user. If no Event Template was specified, the O.R. Data Manager automatically loads a default event template from its hard drive.

For instructions on creating and editing a template, see the *PC Prep/View Operator's Manual*.

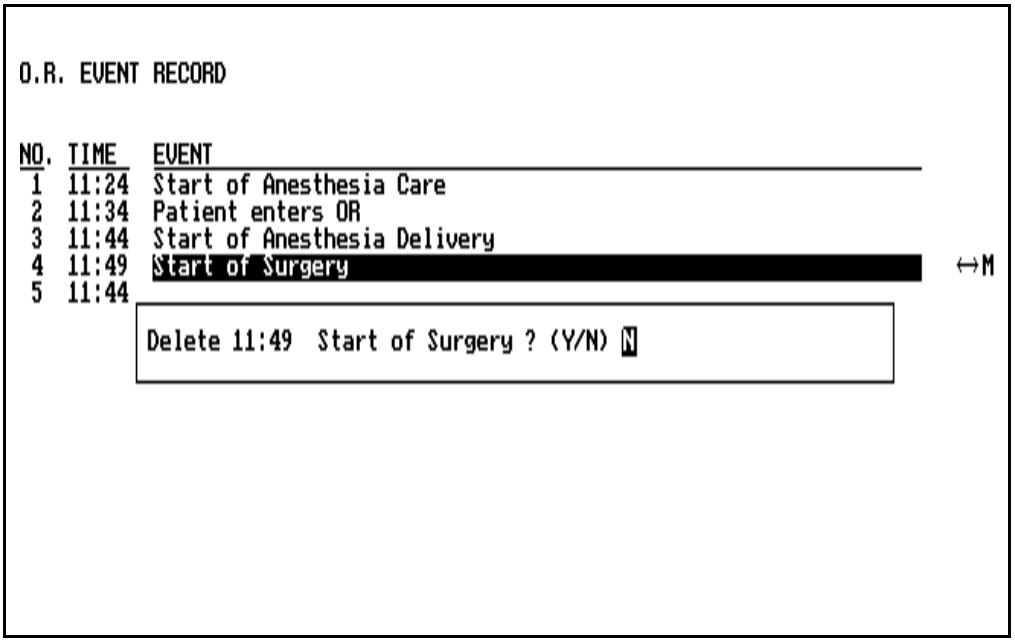
Editing Data

The Edit Mode allows editing of any nonblank event description cell in the O.R. Event Record screen. Refer to **General Operation,** Edit Mode for use of the edit window.

Deleting an Entry

To delete an entry:

1. Move the cursor to any cell in the event entry to be deleted.
2. Press DELETE ENTRY. A prompt appears on the screen to confirm the deletion.


O.R. EVENT RECORD
NO. TIME EVENT
1 11:24 Start of Anesthesia Care
2 11:34 Patient enters OR
3 11:44 Start of Anesthesia Delivery
4 11:49 Start of Surgery
5 11:44
↔M
Delete 11:49 Start of Surgery ? (Y/N) N

- To delete the data from the screen and disk, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- To cancel the DELETE ENTRY request, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

If you do not respond within 30 seconds, nothing is deleted; the message is removed from the screen.

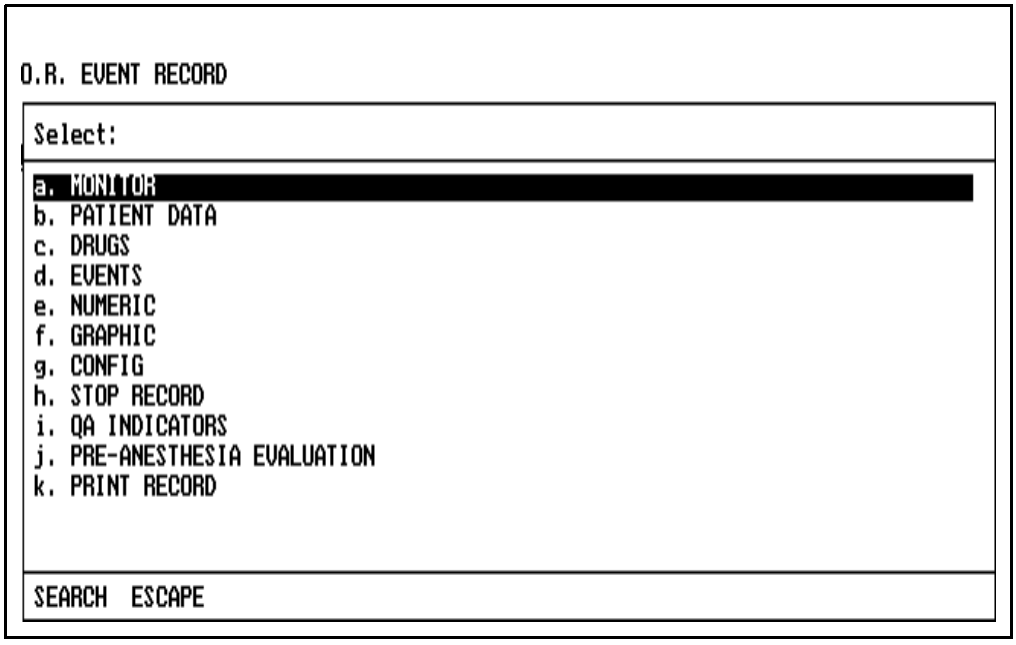
Section 5 - Operation
O.R. Data Manager

Displaying the O.R. Data Manager Screen Menu

To display the O. R. Data Manager screen menu:

1. Move the cursor to the M at the right of the O.R. Event Record screen.

2. Press the Datagrip trigger or the SELECT ENTRY key to bring up the menu.



This menu allows entry into other screens, and the STOP RECORD option allows you to stop recording.

Make the desired selection by using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

Exiting the Screen

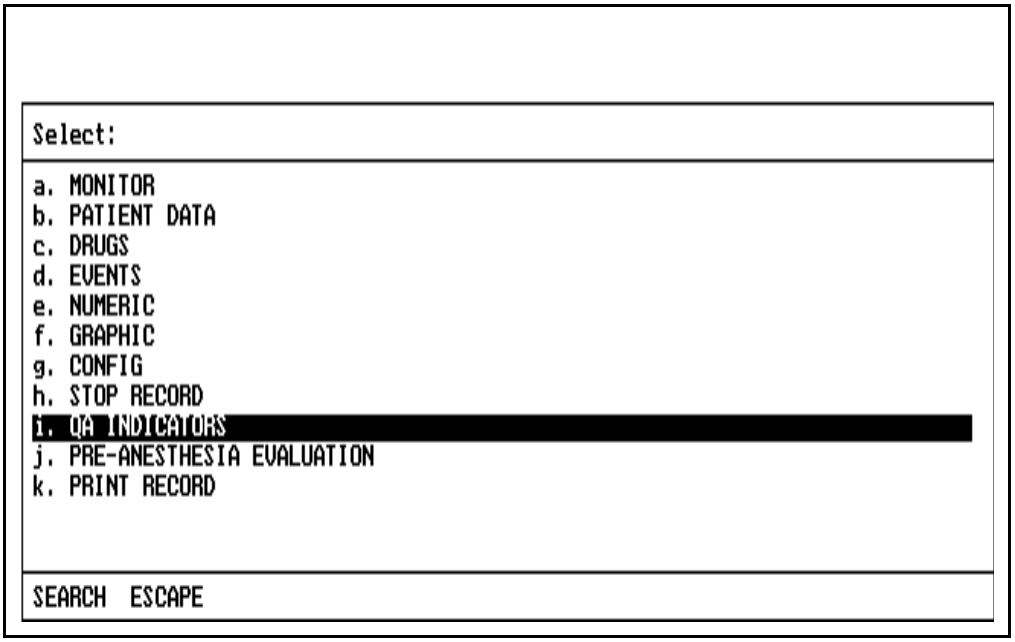
To exit the O.R. Event Record screen, press any of the other Screen keys, or use the Datagrip to select any other option from the O.R. Data Manager screen menu.

QA Indicators

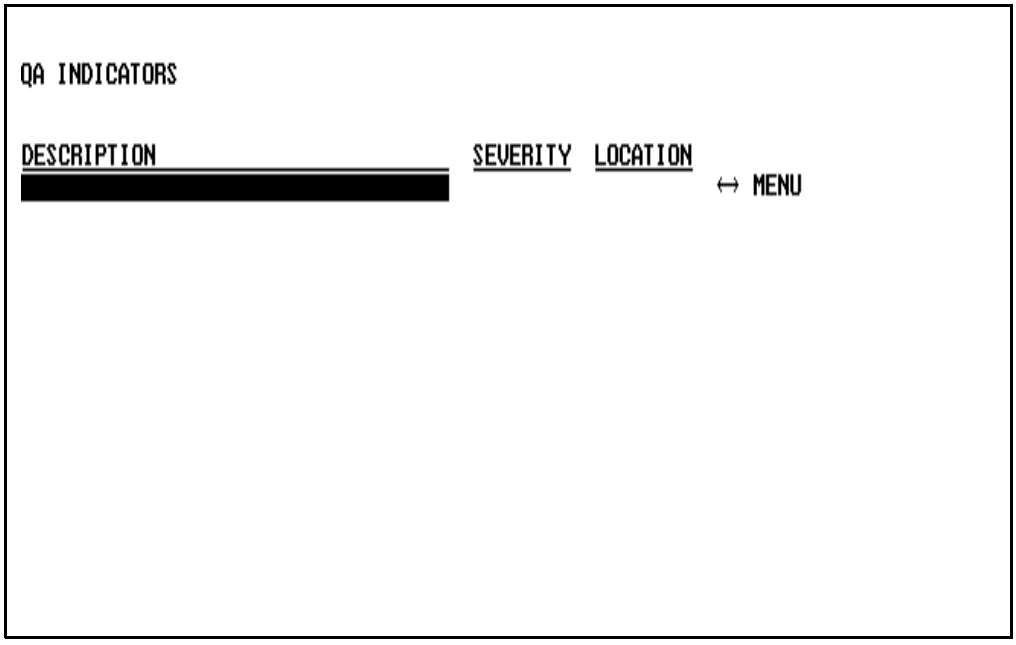
The QA Indicators screen provides a method of separately recording untoward events that may occur during a case. These events are not part of the printed anesthesia record.

Selecting the QA Indicators Screen

The QA Indicators screen can be selected from the O.R. Data Manager Screen Menu by typing its key letter or highlighting QA INDICATORS and pressing the ENTER key or the Datagrip trigger.



In addition to selecting from the O.R. Data Manager Screen Menu, the QA Indicators screen can also be selected from the Event main menu, or it can be selected at any time by pressing the key combination ALT-Q.



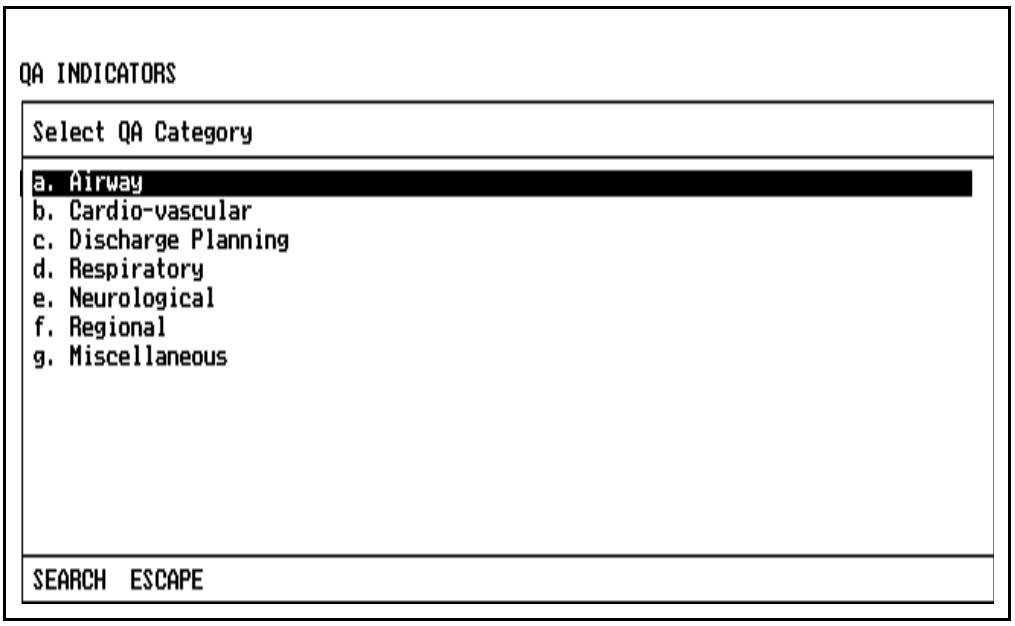
Entering Data

Entries are made by selecting from pop-up menus that are accessed from each of the three data fields. The Severity field can also be entered from the keyboard. None of the fields can be edited.

The content of the Description and Location pop-up menus is site-configurable for QA purposes. If no site-configured list exists, default menus will appear.

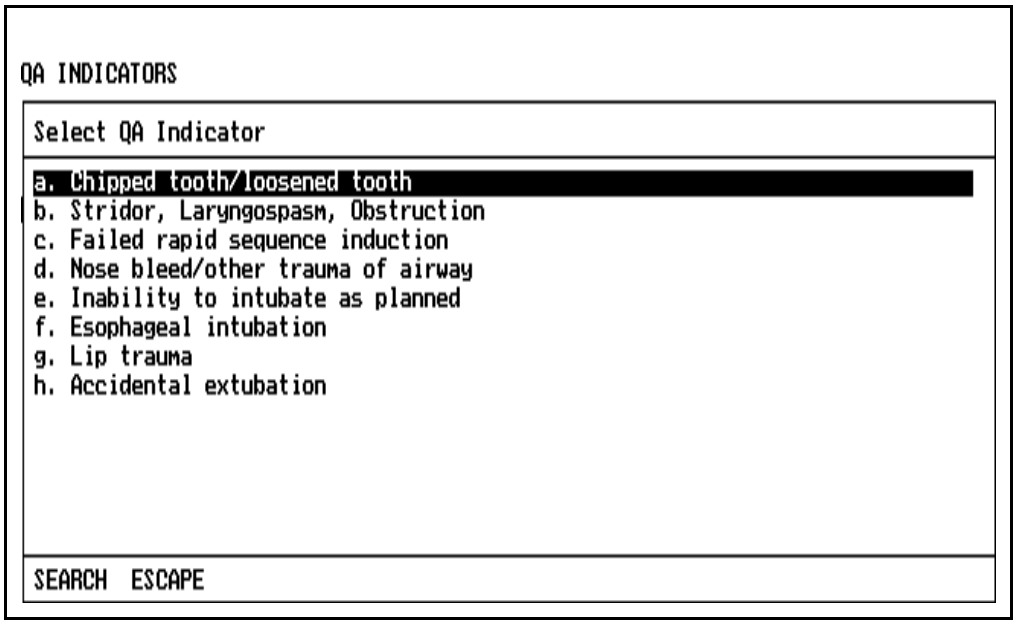
Selecting QA CATEGORY

With the cursor in the DESCRIPTION field, press the SELECT ENTRY key or the Datagrip trigger. A user-configurable (or default) submenu appears:



The content of the submenu is site-configurable. The menu list is configured using the PC Prep/View software program and is later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

To select a category, use the procedures described under **Pop-up Menus**. Selection of a category causes a second user-configurable (or default) list to appear which provides a list of choices within the category.

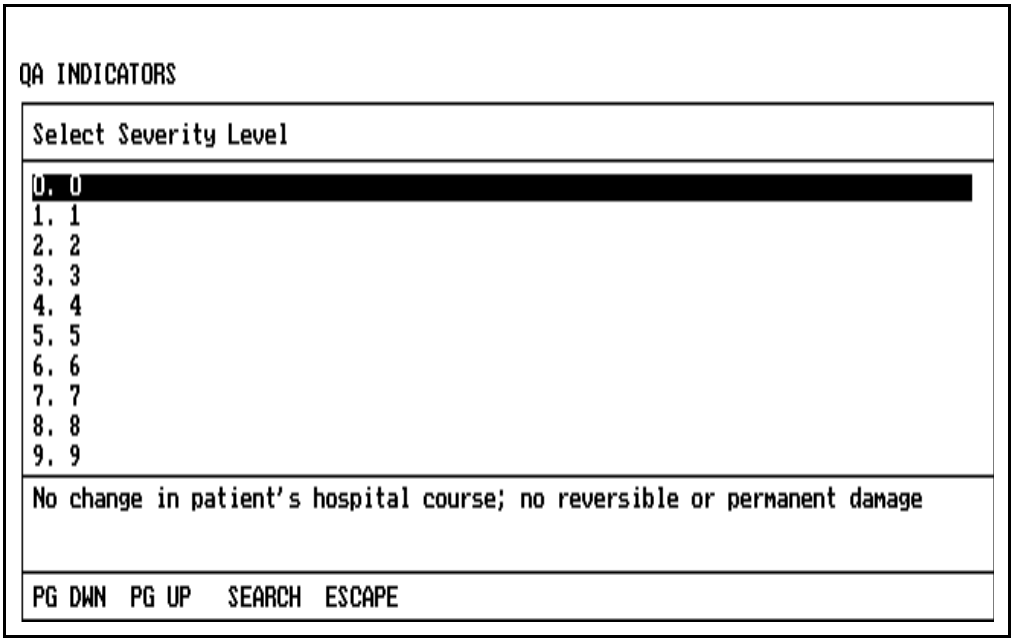


The content of the list is site-configurable. The menu list is configured using the PC Prep/View software program and is later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

To make a selection from the list, use the procedures described under **Pop-up Menus**.

Selecting SEVERITY

Move the cursor to the SEVERITY field, press the SELECT ENTRY key or the Datagrip trigger. The following submenu appears:

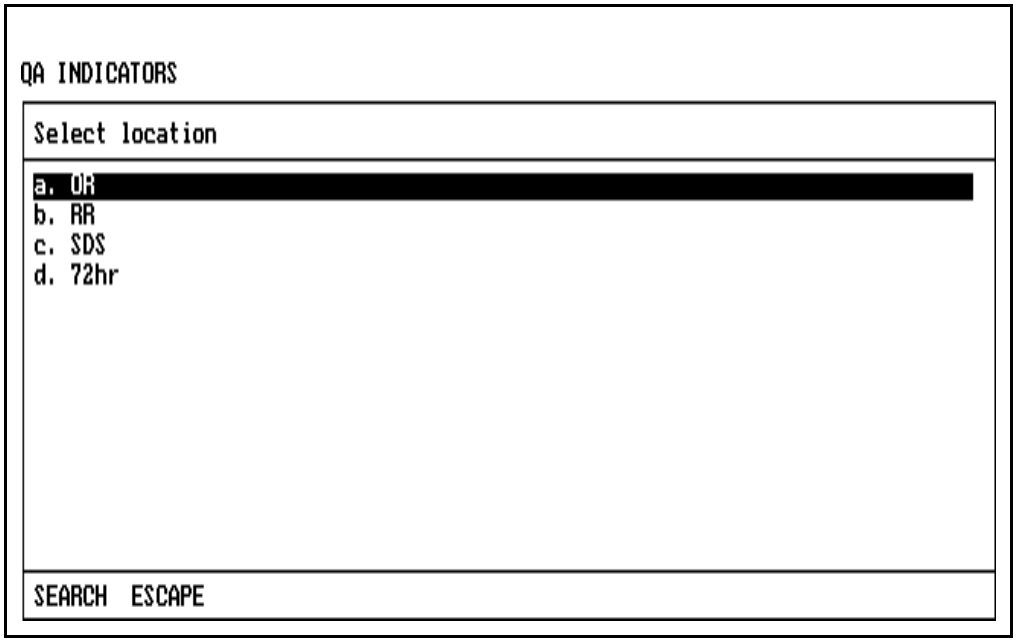


To make a selection, use the procedures described under **Pop-up Menus**.

The Severity field can also be manually entered using the keyboard. Only the values 0 through 10 will be accepted for this field.

Selecting LOCATION

Move the cursor to the LOCATION field, press the SELECT ENTRY key or the Datagrip trigger. A user configurable list appears:



The content of the list is site-configurable. The menu list is configured using the PC Prep/View software program and is later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

To make a selection, use the procedures described earlier in this section under **Pop-up Menus.**

Exiting the Screen

To exit the QA Indicators screen, press any of the other screen keys or use the Datagrip to select any other option from the O.R. Data Manager screen menu.

Numeric Data Screen

The Numeric Data screen is divided into two sections. The upper portion of the screen displays information that is detected by the host anesthesia system. This information cannot be edited. The items displayed can be configured as described in **System Configuration**. If not specifically configured, the following default list of items will appear:

- Inspiratory oxygen concentration (Fi O2)
- Inspiratory nitrous-oxide concentration (Fi N2O)
  (Displayed only if connected to a host machine with a MULTISPEC or a Vitalert 3000 Series monitor with a gas analyzer)
- Inspiratory anesthetic agent concentration (Agent, Enflurane, Isoflurane, Halothane, Sevoflurane, Desflurane)
  (Displayed only if connected to a host machine with a MULTISPEC or a Vitalert 3000 Series monitor with a gas analyzer)
- End-tidal carbon dioxide (ET-CO2)
  (Displayed only if connected to a host machine with a MULTISPEC or Capnomed, or a Vitalert 3000 Series monitor with a gas analyzer)
- Peak inspiratory pressure (P.I.P)
- Mean central venous pressure (CVP)
- Tidal volume (Tidal Vol)

The lower portion of the screen contains a record of patient flows and fluids. This information, which is entered through the keyboard or the Datagrip, can be edited.

For ease of data entry, the names and units in the lower portion of the screen can be initialized to default values from a site list at the start of the case. The site list can contain items from the Numeric Items List and/or the Drug Dictionary. These items will always appear in the Numeric Data screen and on the printed anesthesia record. Site lists are configured using the PC Prep/View software program and are later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

Both portions of the screen share a common time line, which appears along the top of the screen. The time line is displayed in either 5 minute or 15 minute intervals, as specified at the start of the case or on the Configure Numeric Screen subscreen (see **System Configuration**). A maximum of 1 hour and 45 minutes of information can be displayed on the screen at one time. The current time is displayed in the upper right corner of the screen.

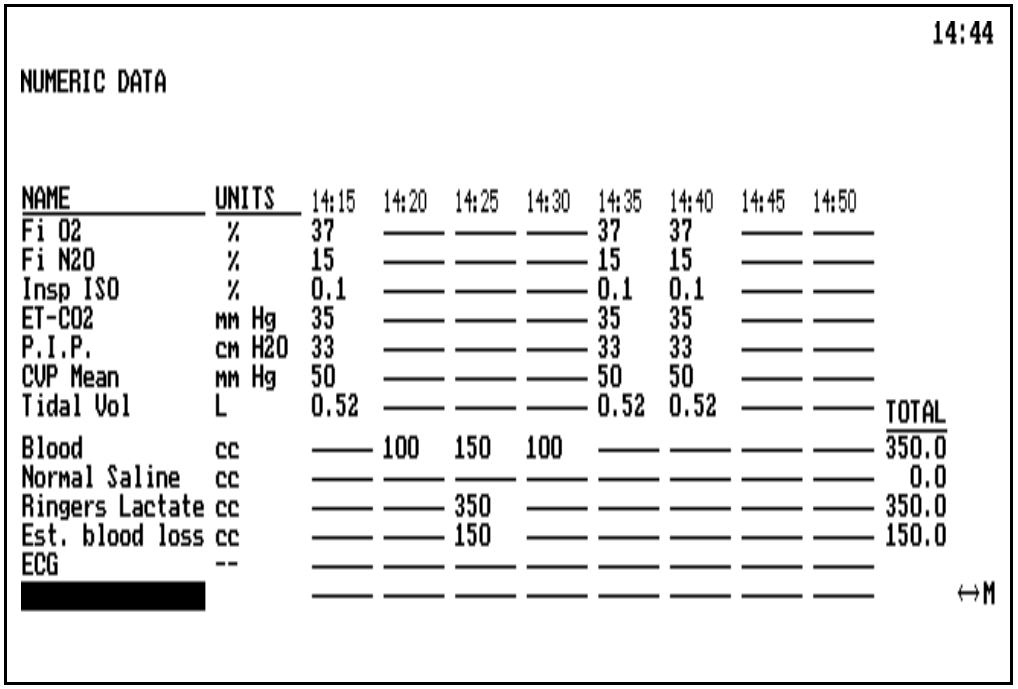
Each data value in the upper portion of the numeric screen (and on the printed anesthesia record) is a continuously updated median of the last 11 values taken over approximately 22 seconds.

All numeric item information is cleared from memory at the start of a case.

Selecting the Screen

To enter the Numeric screen, press the NUMERIC key, or use the Datagrip to select NUMERIC from the O.R. Data Manager screen menu.

The arrow symbol (either ↔ or ↕) at the right of the screen indicates the direction the cursor will move when you turn the Datagrip thumbwheel. The ↔ indicator means you can move the cursor left and right, while the ↕ indicator means you can move the cursor up and down. In the vertical mode, the entire line is highlighted for readability. To switch between horizontal and vertical movement, position the cursor on the direction indicator, and press the Datagrip trigger or the SELECT ENTRY key.



Selecting Items From the Numeric Items Pop-Up Menu

Numeric items can be typed in from the keyboard or entered from a numeric items pop-up menu. The content of the numeric items pop-up menu is site-configurable.

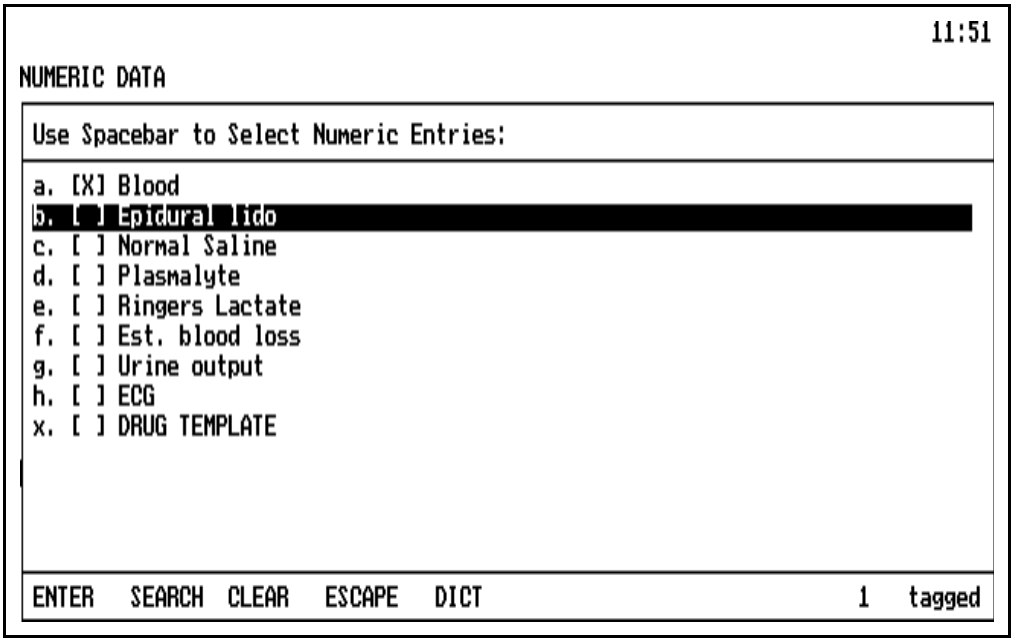
The numeric items menu is configured using the PC Prep/View software program and is later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

If no site-configured numeric items menu exists, a default menu will appear.

To make a selection from the numeric items menu:

1. In the Numeric Data screen, move the cursor into the desired cell under the NAME column.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the pop-up menu that contains the list of numeric items.


11:51
NUMERIC DATA
Use Spacebar to Select Numeric Entries:
a. [X] Blood
b. [ ] Epidural lido
c. [ ] Normal Saline
d. [ ] Plasmalyte
e. [ ] Ringers Lactate
f. [ ] Est. blood loss
g. [ ] Urine output
h. [ ] ECG
x. [ ] DRUG TEMPLATE
ENTER SEARCH CLEAR ESCAPE DICT
1 tagged

If the system is configured in the Single Entry format (see **System Configuration**), the pop-up menu will always appear in the Single Entry format.

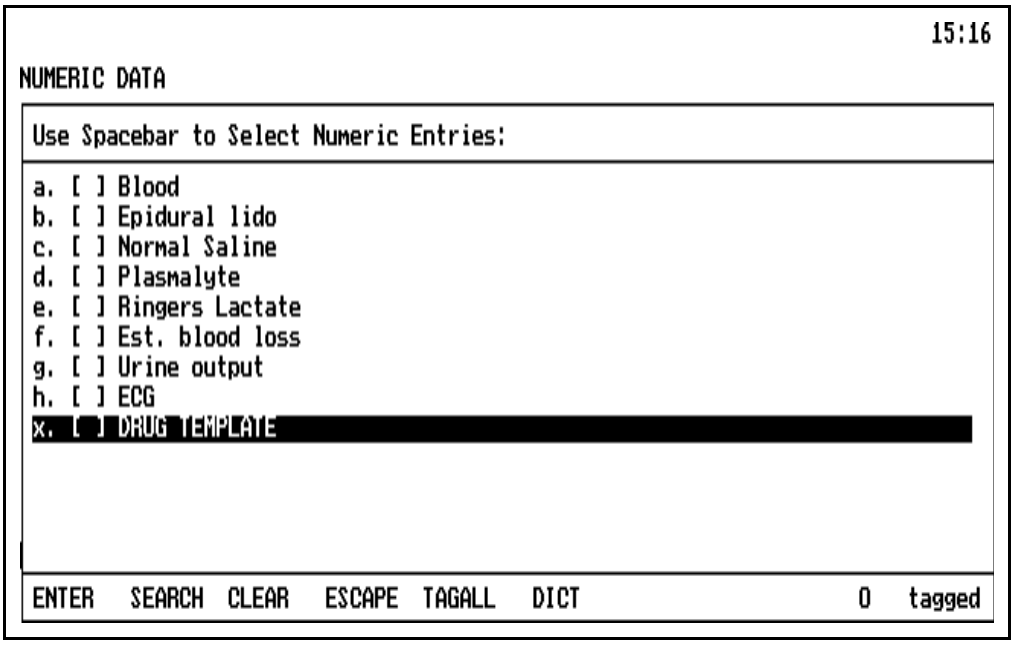
If the Pick List format was chosen in the configuration options, the pop-up menu will always appear in the Pick List format.

Selecting an item is described earlier in this section under **General Operation** and **Pop-up Menus.**

When the item is selected, the UNITS column is automatically updated with the units of measure specified in the list.

Special Entries

When selecting entries for the Numeric Data screen from a pop-up menu, there is a special entry for DRUG TEMPLATE with key letter "x". Typing "x" or selecting the Drug Template entry will immediately bring up the Drug Template for making drug selection(s).


15:16
NUMERIC DATA
Use Spacebar to Select Numeric Entries:
a. [ ] Blood
b. [ ] Epidural lido
c. [ ] Normal Saline
d. [ ] Plasmalyte
e. [ ] Ringers Lactate
f. [ ] Est. blood loss
g. [ ] Urine output
h. [ ] ECG
x. [ ] DRUG TEMPLATE
ENTER SEARCH CLEAR ESCAPE TAGALL DICT 0 tagged

If any menu selections were made BEFORE selecting the drug template, those entries will be deselected.

Selecting Numeric Items From the Drug Template

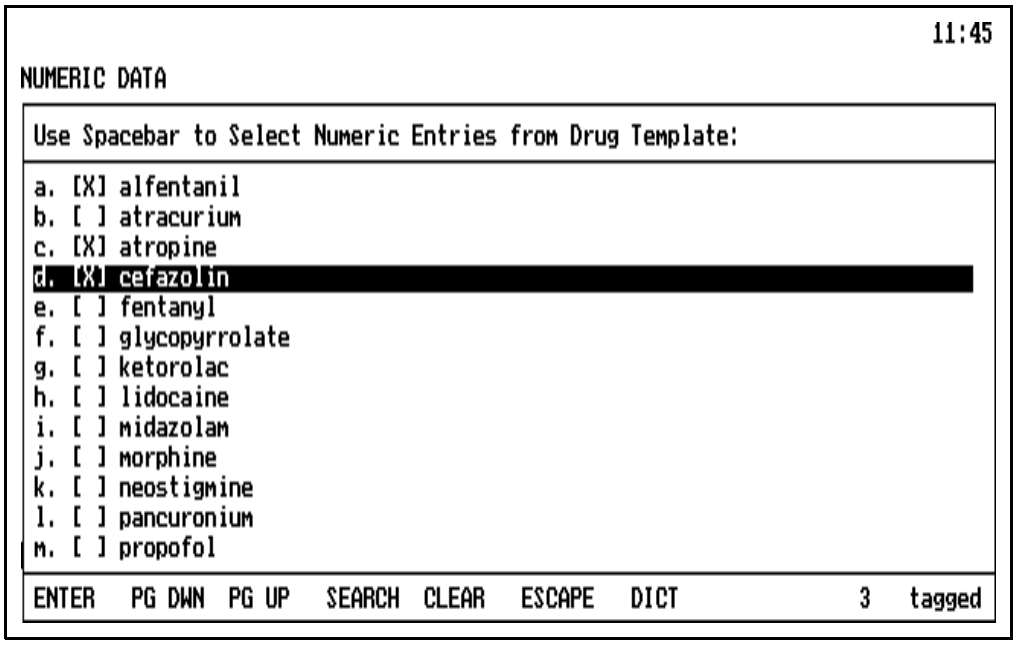
The last item in the numeric items pop-up menu is the Drug Template.

To invoke the Drug Template, press the "x" key letter, or highlight the option and press the spacebar or the Datagrip trigger. The O.R. Data Manager will load the Drug Template specified earlier in the case. If no Drug Template was specified, the O.R. Data Manager will automatically load a default drug template from its hard drive.

For instructions on creating and editing drug templates, refer to the *PC Prep/View Operator's Manual*.

If the system is configured in the Single Entry format (see **System Configuration**), the pop-up menu will always appear in the Single Entry format.

If the Pick List format was chosen in the configuration options, the Drug Template will appear in Pick List format as shown:


11:45
NUMERIC DATA
Use Spacebar to Select Numeric Entries from Drug Template:
a. [X] alfentanil
b. [ ] atracurium
c. [X] atropine
d. [X] cefazolin
e. [ ] fentanyl
f. [ ] glycopyrrolate
g. [ ] ketorolac
h. [ ] lidocaine
i. [ ] midazolam
j. [ ] morphine
k. [ ] neostigmine
l. [ ] pancuronium
m. [ ] propofol
ENTER PG DWN PG UP SEARCH CLEAR ESCAPE DICT 3 tagged

Selecting an entry is described earlier in this section under **General Operation** and **Pop-up Menus.**

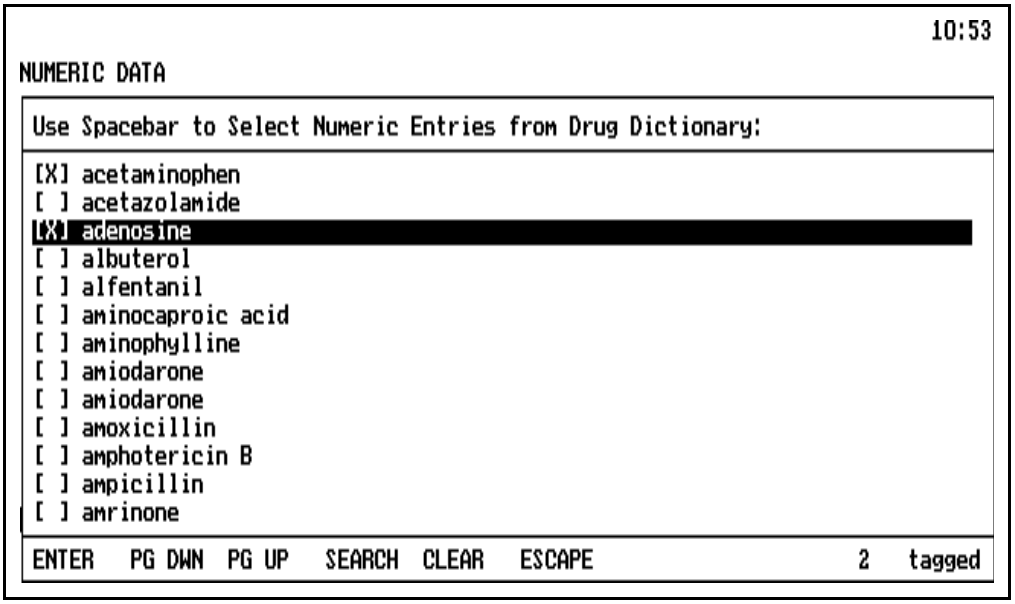
When the drug is selected, the UNITS column is automatically updated with the units of measure specified in the template.

Selecting Drugs From the Drug Dictionary

The Drug Dictionary, which is a list of commonly used drugs and fluids, is accessed by making the DICT selection at the bottom of the drug template screen. The content of the Drug Dictionary is site-configurable. If no site-configured Drug Dictionary exists, a default list will appear.

Lists are configured using the PC Prep/View software program and are later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

When you select the Drug Dictionary option, a pop-up window appears listing all the names in the Drug Dictionary.



Selecting an entry is described earlier in this section under **General Operation** and **Pop-up Menus.**

When the drug is selected, the UNITS column is automatically updated with the units of measure specified in the Drug Dictionary.

Auto Drug Dictionary Option

If the Auto Drug Dictionary option is enabled on the Configuration Options subscreen (see **System Configuration**), the O.R. Data Manager will complete a drug name entered from the keyboard automatically as soon as the user enters a string that uniquely identifies a drug in the Drug Dictionary. If the drug name is in the drug template, the units specified in the drug template will also be automatically entered. Otherwise, the units from the Drug Dictionary will be automatically entered. This feature is useful for ensuring that drug names are spelled correctly and are consistent from record to record.

Selecting Units of Measure

You can enter units of measure directly from the keyboard or from a pop-up menu. The content of the units pop-up menu is site-configurable. If no site-configured units list exists, a default menu will appear.

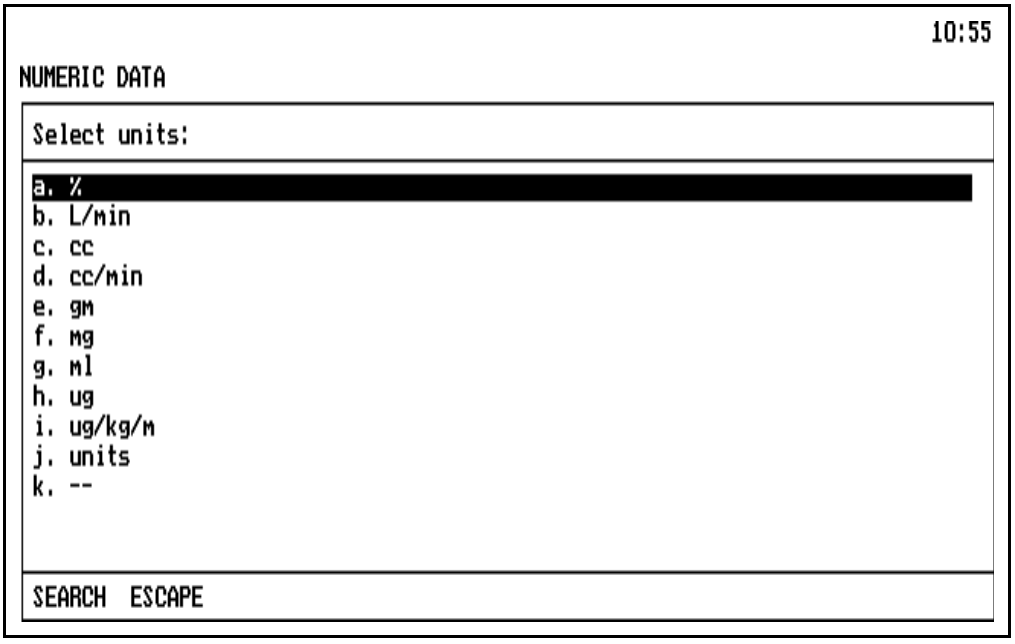
Lists are configured using the PC Prep/View software program and are later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

To select units of measure from the pop-up menu:

1. In the Numeric Data screen, move the cursor to the desired cell in the UNITS column.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the pop-up menu, which contains the list of units of measure.

3. To make a selection, use the procedures described under **Pop-up Menus**.



Section 5 - Operation
O.R. Data Manager

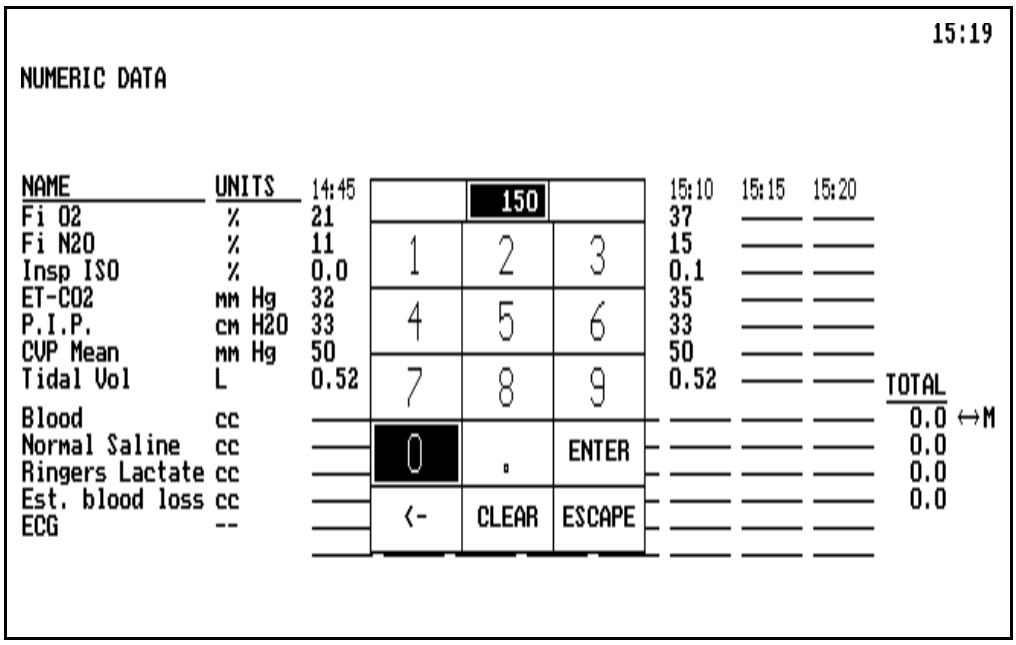
Entering Numeric Data

You can make numeric entries via the keyboard simply by typing them in, or you can select numbers from a pop-up numeric keypad.

To make numeric entries using the pop-up numeric keypad:

1. In the Numeric Data screen, move the cursor to the desired cell.

2. Press the Datagrip trigger or the SELECT ENTRY key to display a pop-up numeric keypad used to enter numeric amounts.



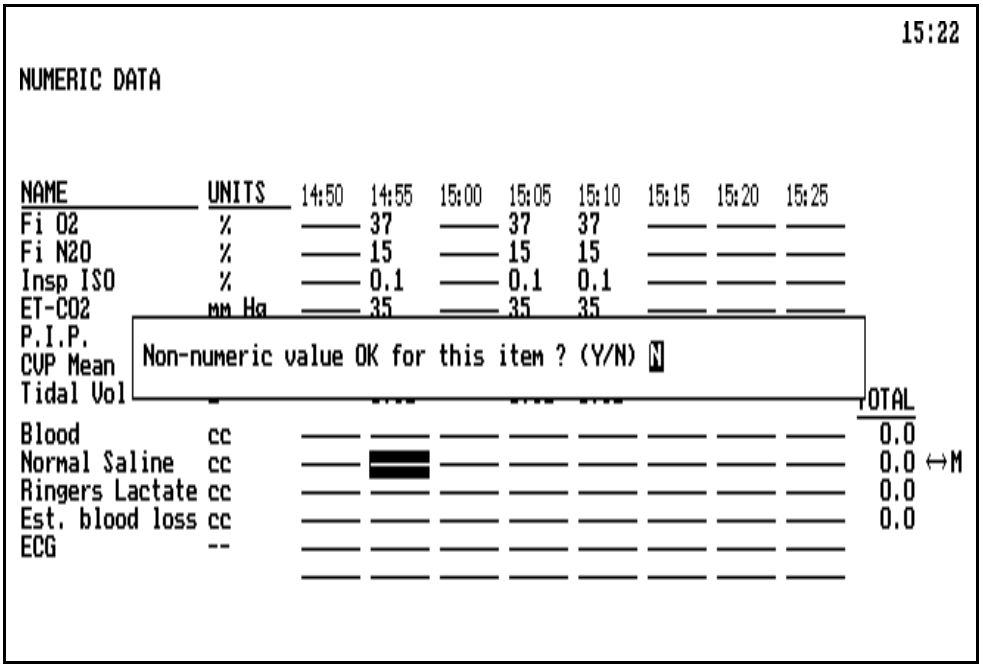
3. Highlight a number using the Datagrip thumbwheel or the cursor keys, and press the Datagrip trigger or the ENTER key. The selected number will appear in the highlighted box at the top of the numeric keypad.

4. Continue entering numbers in this manner until the proper amount is displayed. Then highlight the box in the keypad marked ENTER, and press the Datagrip trigger or the ENTER key. The specified amount is inserted in the cell, and the pop-up numeric keypad is removed from the screen.

If you make a mistake while selecting numbers from the keypad, use the backspace option in the table (←) to delete the last number selected, or the CLEAR option to remove all numbers selected thus far. The ESCAPE option removes the numeric keypad from the screen without making any changes.

Entering Nonnumeric Data

With the exception of the NAME and UNITS columns, most of the data entered on this screen is numeric. You can, however, enter non-numeric information in this screen. Because the entries in this screen are usually numbers, the first time you attempt to make a non-numeric entry for a given item, a screen prompt confirms that you want to enter non-numeric information in that row.


15:22
NUMERIC DATA
NAME UNITS 14:50 14:55 15:00 15:05 15:10 15:15 15:20 15:25
Fi O2 % 37 37 37
Fi N2O % 15 15 15
Insp ISO % 0.1 0.1 0.1
ET-CO2 mm Hg 35 35 35
P.I.P.
CVP Mean
Tidal Vol
Non-numeric value OK for this item ? (Y/N) N
TOTAL
Blood cc 0.0
Normal Saline cc 0.0 ↔M
Ringers Lactate cc 0.0
Est. blood loss cc 0.0
ECG --

- To enter non-numeric information, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.

  If non-numeric information is entered, the TOTAL function is automatically disabled for that row.

- If you don't want to enter non-numeric information, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

If you do not respond within 30 seconds, nonnumeric information is not accepted for that row, and the message disappears.

Entering ECG Heart Rhythm

If you want to enter data for ECG rhythm, which is always nonnumeric, you can use a pop-up menu. The content of the heart rhythm menu is site-configurable. If no site-configured list exists, a default menu will appear.

Lists are configured using the PC Prep/View software program and are later installed using the O.R. Data Manager Import Site Lists function. If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically at power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual* and the *System Configuration* section of this manual.

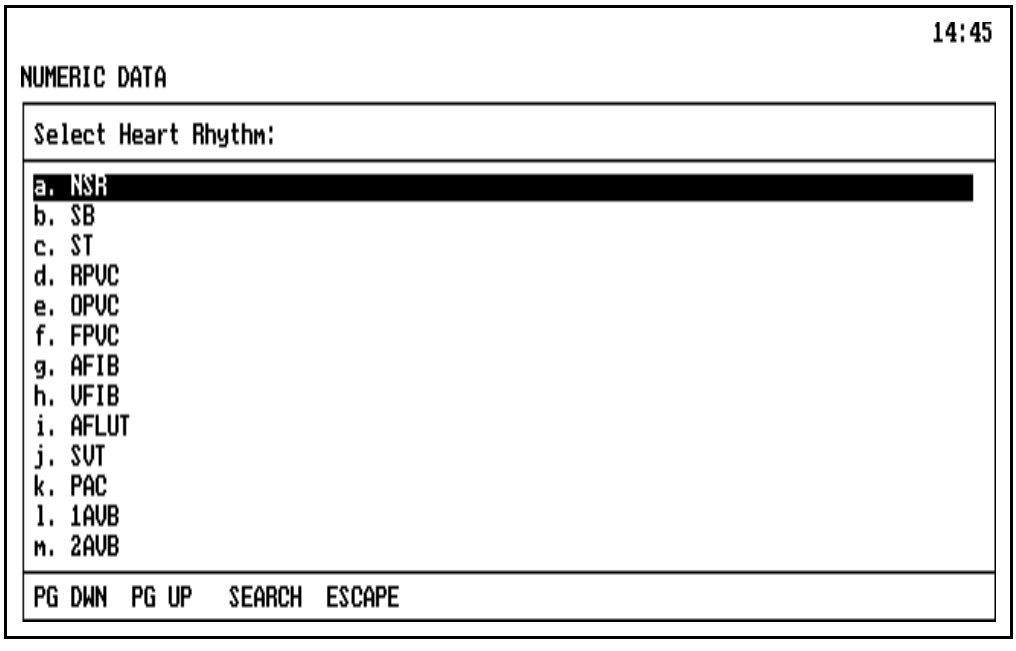
The heart rhythm menu can be used if the numeric name is ECG or EKG.

To select heart rhythm from the pop-up menu:

1. In the Numeric Data screen, move the cursor to the desired cell in the ECG or EKG row.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the pop-up menu, which contains the list of heart rhythm choices.

3. To make a selection, use the procedures described under **Pop-up Menus**.



Disabling/ Enabling Totals

There are several options for the Totals displayed in the Numeric Data screen:

a. Total ON displays the sum of all numeric entries on a line.

b. Total OFF disables the Total function, leaving the TOTAL column blank for that line.

c. Last is Total displays the last (latest in time) entry for the item as the total. This supports entering total fluid in or out as entries for given times as opposed to entering incremental differences. For example, the user may be reading a bottle or bag and wish to note that at 10:15 the total was 1000cc, at 10:30 it was 1200cc, etc. In this case, the last entry is the final total.

d. Manual Total allows a manual entry to be made in the TOTAL column. This is useful when recording rate oriented items such as flows or drips. The user may want to note that at 10:25 a drip of approximately 100 cc/min was started and at the end manually note the exact total.

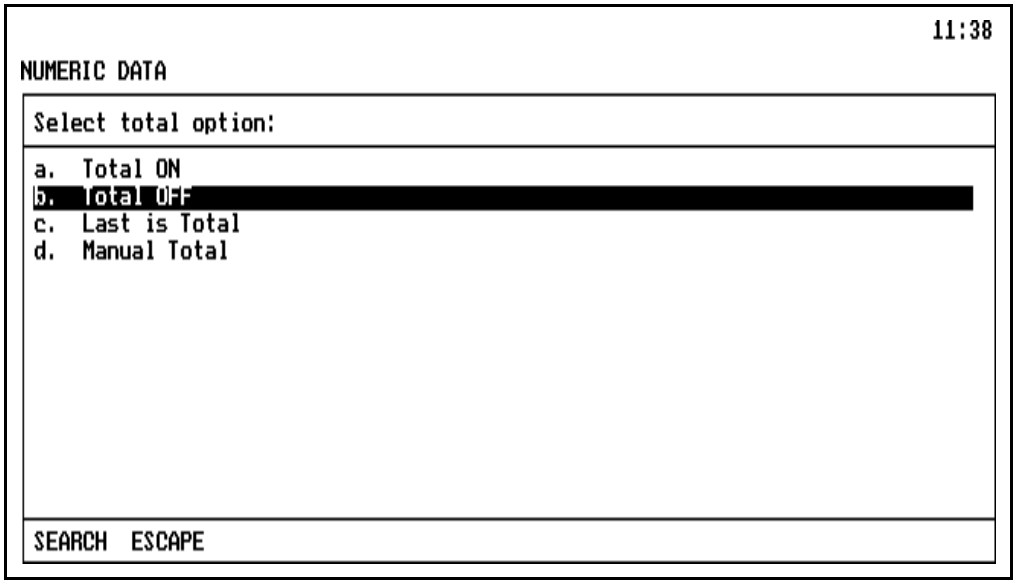
To select an option:

1. Highlight the TOTAL cell for the desired entry.

2. Press the SELECT ENTRY key or the Datagrip trigger.

3. To make a selection, use the procedures described under **Pop-up Menus**.

If an item is defined in the numeric items list as a physiological variable (i.e. cardiac output), the total for that item will be automatically disabled. If you want to enable the total for an item that was previously designated as nonnumeric, you may do so, provided there is no nonnumeric data present for that item.



Editing Data

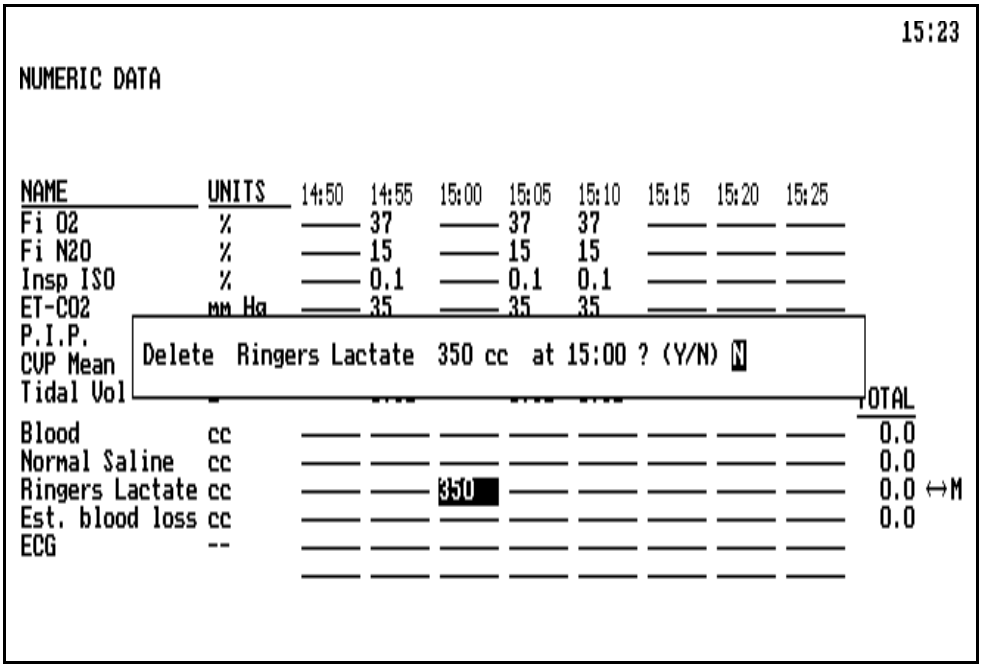
The Edit Mode allows editing of selected cells in the Numeric Data screen. You can edit any cell in the bottom portion of the screen except blank fields. The TOTAL field can be edited only if the Total option is set to Manual. Refer to **General Operation,** Edit Mode for use of the edit window.

Deleting an Entry

To delete a single entry in a line:

1. Move to the cell to be deleted (it can be any of the entries in the time columns from the bottom portion of the screen).

2. Press DELETE ENTRY. A query appears on the screen to confirm the deletion.


15:23
NUMERIC DATA
NAME UNITS 14:50 14:55 15:00 15:05 15:10 15:15 15:20 15:25
Fi O2 % 37 37 37
Fi N2O % 15 15 15
Insp ISO % 0.1 0.1 0.1
ET-CO2 mm Hg 35 35 35
P.I.P.
CVP Mean
Tidal Vol
Delete Ringers Lactate 350 cc at 15:00 ? (Y/N) N
TOTAL
Blood cc 0.0
Normal Saline cc 0.0
Ringers Lactate cc 350 0.0 ↔M
Est. blood loss cc 0.0
ECG --

- To delete the data from the screen and disk, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.

- To cancel the DELETE ENTRY request, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

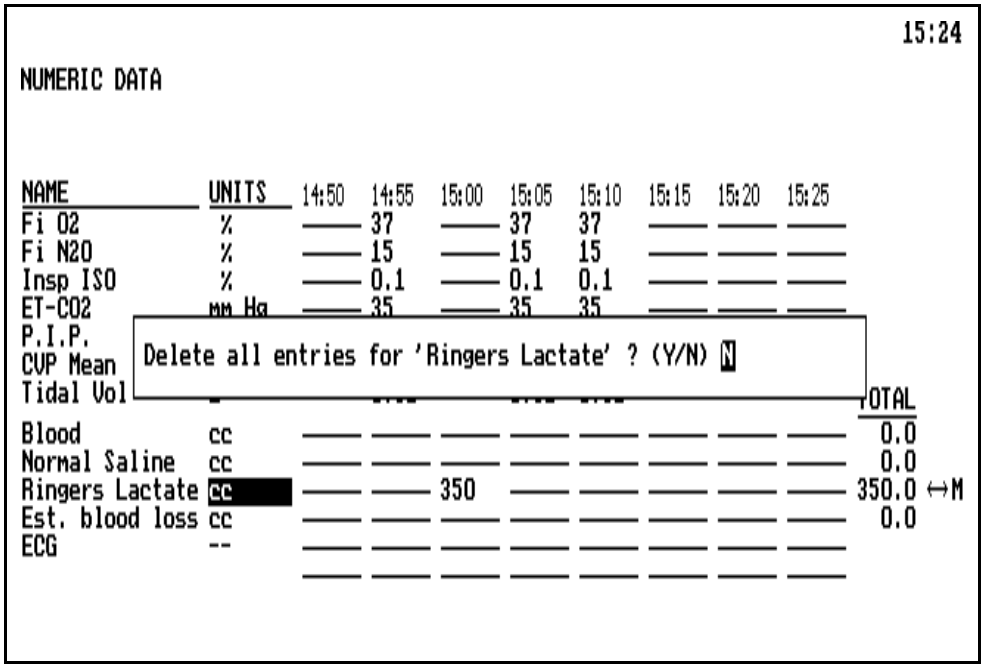
If you do not respond within 30 seconds, nothing is deleted; the message is removed from the screen.

Deleting All Entries In a Line

To delete **all** entries in a line:

1. Move to the NAME or UNITS column in the line to be deleted.

2. Press DELETE ENTRY. A query appears on the screen to confirm the deletion.



- To delete the data from the screen and disk, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger. If you specify Y, another prompt appears to confirm the deletion; respond accordingly.

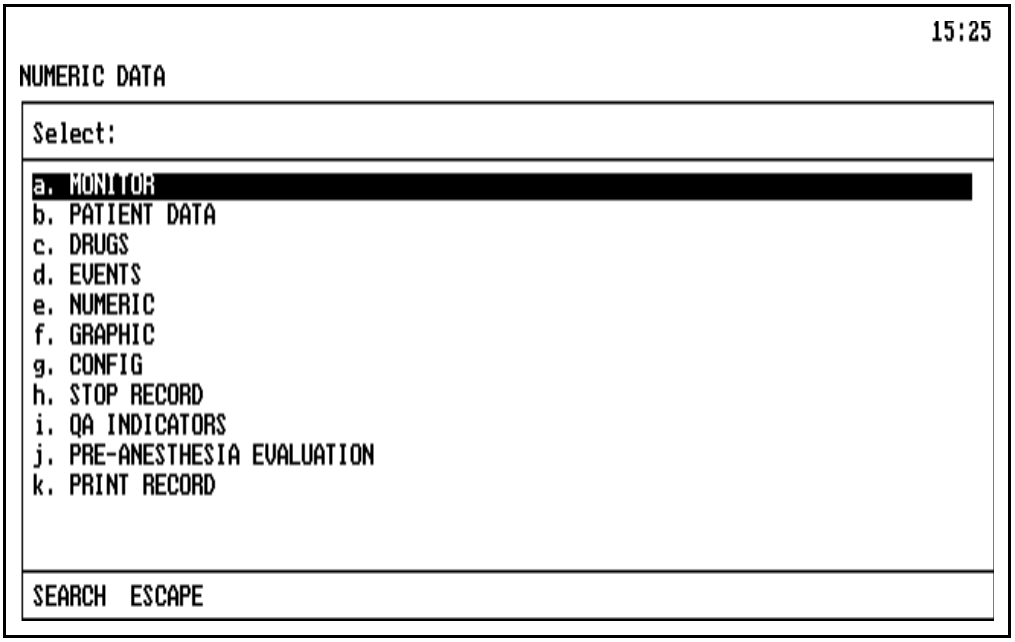
- To cancel the DELETE ENTRY request, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

If you do not respond within 30 seconds, nothing is deleted, and the message is removed from the screen.

Displaying the O.R. Data Manager Screen Menu

To display the O. R. Data Manager screen menu:

1. Move the cursor to the M at the right of the Numeric Data screen.
2. Press the Datagrip trigger or the SELECT ENTRY key to bring up the menu.



This menu allows entry into other screens, and the STOP RECORD option allows you to stop recording.

Make the desired selection using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

Exiting the Screen

To exit the Numeric Data screen, press any of the other Screen keys, or use the Datagrip to select any other option from the O.R. Data Manager screen menu.

Graphic History Screen

The Graphic History screen provides up to 14 hours of history for the following items:

- Oxygen saturation (SpO_2)
- Pulse rate
- Arterial systolic and diastolic blood pressure
- Noninvasive systolic and diastolic blood pressure
- Temperature
- Respiratory rate
- Noncontinuous cardiac output
- PA Wedge Pressure
- PC Wedge Pressure

A time line, displayed in 5 minute intervals, appears at the top of the screen. A maximum of 2 hours of information can be displayed on the screen at one time. You can scroll the screen using the arrow keys or the Datagrip thumbwheel to view information that is not currently on the screen.

Sequence numbers for the drugs and events, indicating the 15-minute time period during which the drug was administered or the event took place, appear above the time line.

The graph displays four scales:

- 0-240 scale (left side of the graph) - for blood pressure, pulse and respiration measurements.
- 0-24 scale (far left side of the graph) - for noncontinuous cardiac output, PA wedge pressure, and PC wedge pressure.
- 56-100 scale (right side of the graph) - for oxygen saturation in percentage.
- 20-42 scale (far right side of the graph) - for temperature in degrees Celsius.

The frequency of recording variables is as follows:

- SpO_2 2 minutes
- Pulse 5 minutes
- Arterial Blood Pressures 5 minutes
- Respiratory Rate 5 minutes
- Temperature 15 minutes
- Noninvasive Blood Pressures on demand
- Noncontinuous cardiac output on demand
- PA Wedge Pressure on demand
- PC Wedge Pressure on demand

When a data value occurs that is beyond the range of the corresponding scale, the data will not be plotted. Depending upon the system configuration (see **System Configuration**), an event may be automatically logged in the O.R. Events Record screen indicating the time, the variable name (i.e. NIBP Systolic), and the value.

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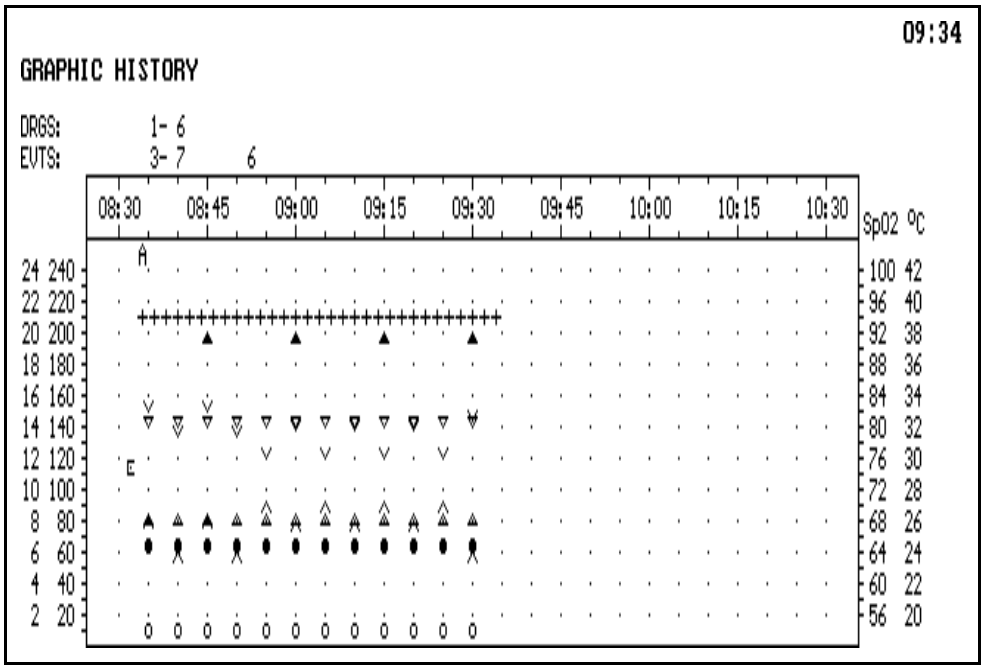
O.R. Data Manager

Selecting the Screen

To enter the Graphic History screen, press the GRAPHIC key, or use the Datagrip to select GRAPHIC from the O.R. Data Manager screen menu.



Screen Symbol Legend

○	Respiration	●	Pulse
∧	Diastolic NIBP	∨	Systolic NIBP
△	Arterial Diastolic BP	▽	Arterial Systolic BP
▲	Temperature	A	Artifact
+	Oxygen Saturation	▣	Card. Out
▣	PA Wedge	▢	PC Wedge

The measured value lies at the top/bottom points of symbols ∧, ∨, △, ▽ and ▲, and at the center of symbols ○, ● and +.

Using the Reference Bar

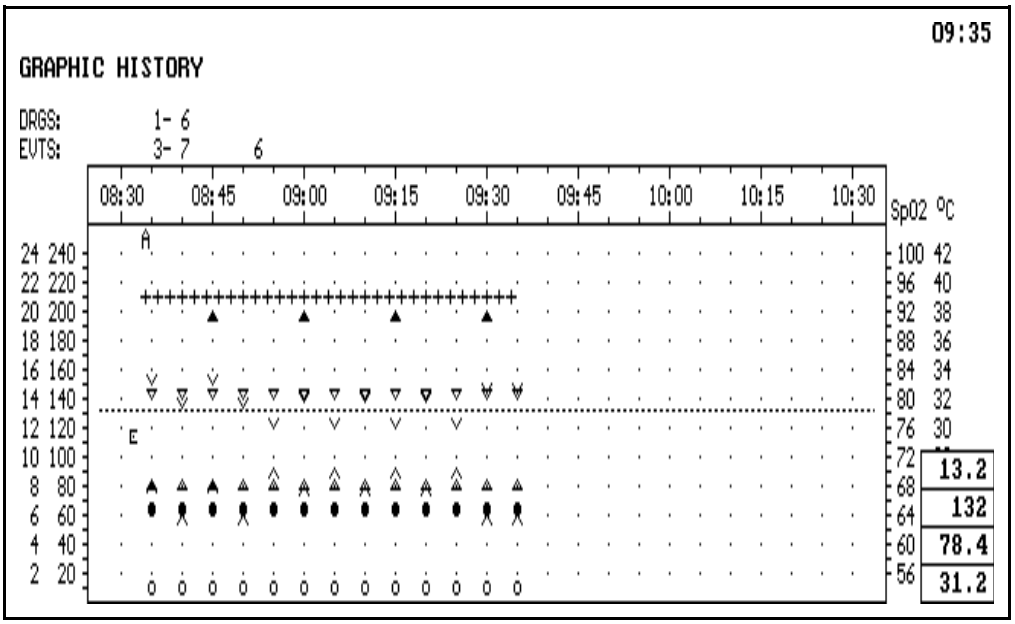
The Graphic History screen contains a reference bar that you can move up and down on the graph to help pinpoint the exact value for a measurement. When the screen appears, the reference bar is not shown.

To use the reference bar, press the ↑ key; the bar appears and moves toward the top of the screen. A four-tier box also appears in the lower right corner of the screen, displaying the current location of the bar on all four scales.

- The top tier of the box shows the scale measurement for noncontinuous cardiac output and wedge pressures.
- The second tier of the box shows the scale measurement for blood pressure, pulse and respiration measurements.
- The third tier shows the scale measurement for oxygen saturation in percent.
- The bottom tier shows the scale measurement for temperature in degrees Celsius.

You can move the reference bar up or down at any time by pressing the ↑ and ↓ keys. To move the reference bar in greater increments, hold down the PAGE key and press the ↑ or ↓ key. To “put away” the reference bar and scale box, press the ↑ or ↓ key until the reference line moves off the top or bottom of the screen, or exit and re-enter the screen.

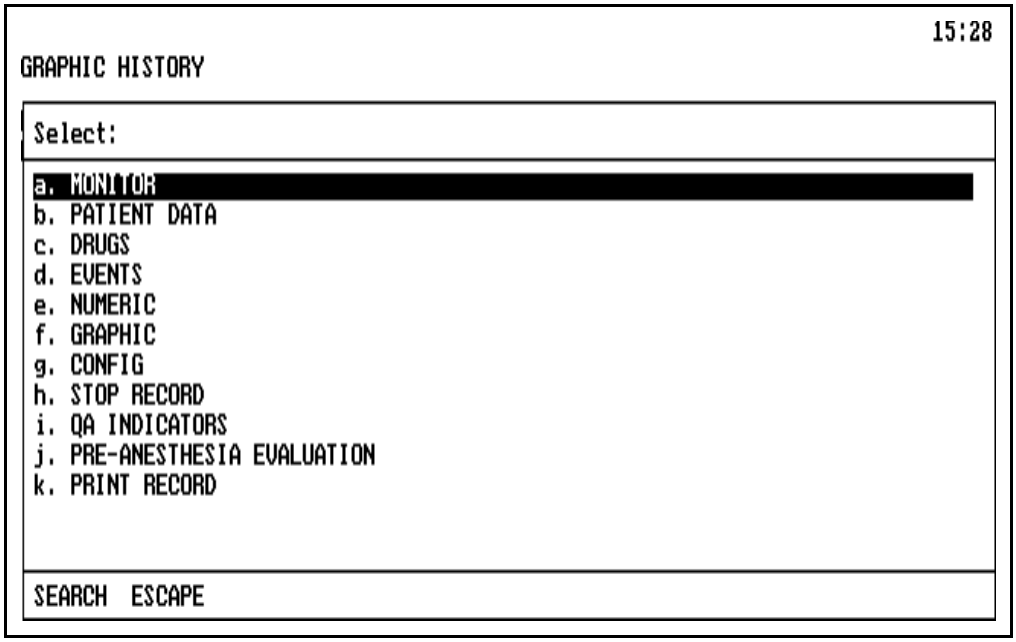
For example, in the following figure, the position of the reference bar at the bottom of the systolic NIBP symbol (∨) accurately shows that the systolic NIBP at 08:40 and 08:50 was 132 (shown in the box at the bottom right corner).



Section 5 - Operation
O.R. Data Manager

Displaying the O.R. Data Manager Screen Menu

To display the O. R. Data Manager screen menu, press the Datagrip trigger or the SELECT ENTRY key to bring up the menu.



This menu allows entry into other screens, and the STOP RECORD option allows you to stop recording.

Make the desired selection using the procedures described earlier in this section under **General Operation** and **Pop-up Menus.**

Exiting the Screen

To exit the Graphic History screen, press any of the other Screen keys, or use the Datagrip to select any other option from the O.R. Data Manager screen menu.

Printing Anesthesia Records

If the optional printer is installed, you can print anesthesia records.

In addition to data recorded by the O.R. Data Manager during the case, printed records contain labeled boxes for anesthesia start time, anesthesia end time, surgery start time, surgery end time, and a check-off box for Preuse Checkout of the anesthesia machine. The boxes are automatically filled in if the record contains the corresponding events (either selected by the user from the Event submenus or automatically entered by the O.R. Data Manager). For more information, see *Selecting from the Event Pop-Up Menu* and *Automatically Entered Events* earlier in this section.

The duration of anesthesia and surgery (ANES TIME and SURG TIME) are calculated by O.R. Data Manager by subtracting start times from end times.

You can print records at any time, from any screen. To print an anesthesia record:

1. Press the PRINT RECORD key or use the Datagrip to select PRINT RECORD from the O.R. Data Manager screen menu. A screen prompt asks for the number of copies to print.

2. Enter a number of copies between 1 and 5. Only numbers 1 through 5 are accepted. When a valid number of copies is entered, the print request is initiated.

If you do not respond within 30 seconds, the print request is canceled. If printing from floppy disk, do not remove the disk from the disk drive while the anesthesia record is being printed.

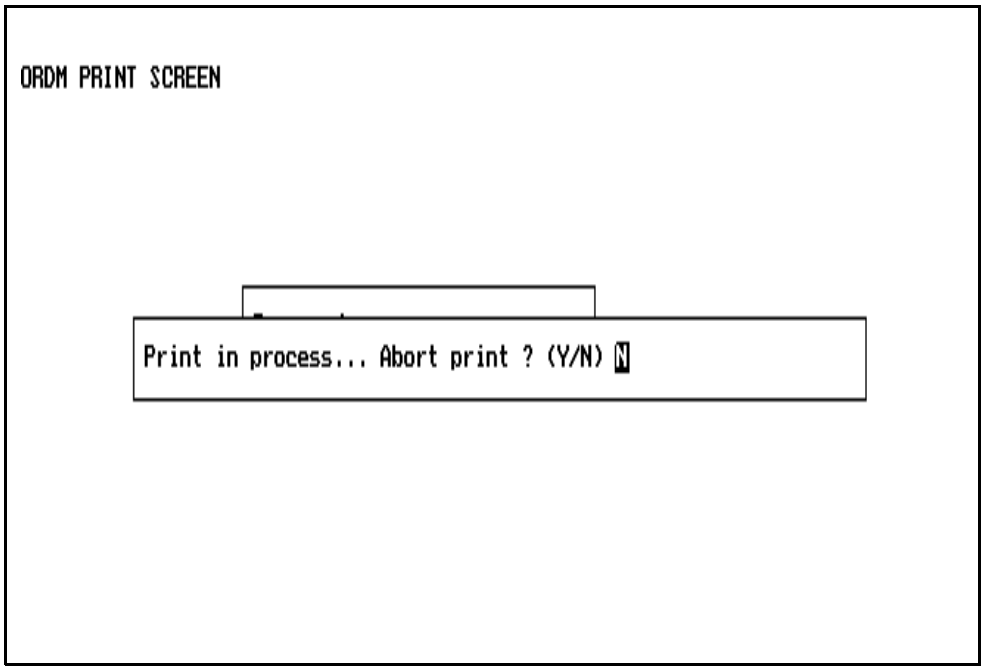
NOTE: You will only be prompted for the number of print copies if you had configured that prompt via the Configuration Screen. If you had configured a specific number of copies (between 1 and 5) in the Configuration Screen, you will not get the above prompt, and the specified number of copies will be printed automatically. For more information, see *System Configuration - Configuration Options Subscreen*.

Section 5 - Operation
O.R. Data Manager

Canceling a Print Request

To stop the printer before it has completed printing, press PRINT RECORD again, the ESC key, or any Screen key.

After you press the key, a screen prompt asks if you want to abort the print request.



- To cancel the print request, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- To continue printing, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger.

On the following page is an example of an anesthesia record produced and printed by the O.R. Data Manager.

ANESTHESIA RECORD — **Memorial Hospital** — PAGE: 01 of 01

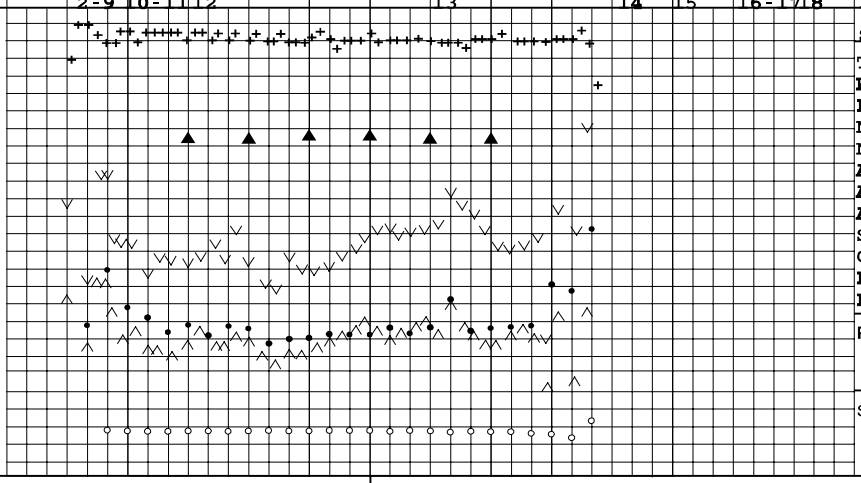
ANESTHETIST(S): Miller, Jill CRNA; Jones, Lauren MD
SURGEON(S): Elliot, Walter MD; Bowden, Zigmund MD
ANESTHESIOLOGIST:
DIAGNOSIS: A.C.L. TEAR LEFT KNEE — CODE:
PROCEDURE(S): KNEE ARTHROSCOPY/SURGERY; A.C.L. REPAIR — CODE(S): 29880-
REMARKS: N.K.D.A.

ANES START	ANES END	ANES TIME	ANESTHESIA TYPE			HT	PAT NAME: Ratliff, Jeremy R
09:20	12:20	03:00	General			72 in (183 cm)	PAT ID: 281382
SURG START	SURG END	SURG TIME	DATE	ASA#	OR#	WT	PAT DOB: 09/22/1976
09:45	11:59	02:14	02-DEC-93	1	3	200 lb (91 kg)	PAT AGE: 17 SEX: M SUPVN: V2.00

	09:00	09:30	10:00	10:30	11:00	11:30	12:00	TOTALS
Fi O2	73	51	50	50	49	49	49	50	50	50	50	%
ET-CO2	34	32	32	32	33	33	34	34	35	48	45	mm Hg
Fi N2O	20	46	46	47	47	46	46	46	46	47	46	%
P. I. P.	20	24	23	23	24	23	23	23	23	23		cm H2O
Insp ISO	0.2	0.8	0.8	0.9	1.0	1.0	1.0	1.0	1.0	1.0	0.5	%
Lactated Ringer	700	100	100	100	50	50	50	50	50	50	50	50	1400.0 cc

SCALES — TEMP | SpO2 | MAIN

TEMP	SpO2	MAIN
42	100	240
40	96	220
38	92	200
36	88	180
34	84	160
32	80	140
30	76	120
28	72	100
26	68	80
24	64	60
22	60	40
20	56	20
		0



DRUGS
EVENTS
SYMBOLS

TEMP	▲
RESP	○
PULSE	•
NIBP SYST	∨
NIBP DIAS	∧
ART SYST	▽
ART DIAS	△
ARTIFACT	A
SpO2	+
CARD. OUT	▬
PA WEDGE	▬
PC WEDGE	□

PRE-USE CHECKOUT: X

SIGNATURE

DRUGS		TOTALS	
1 09:20 midazolam	3 mg	3.00	*
2 09:21 alfentanil	1000 mcg	1000	*
3 09:21 lidocaine	75 mg	75.0	*
4 09:22 propofol	200 mg	200	*
5 09:22 vecuronium	9 mg	9.00	
6 09:25 fentanyl	100 mcg	100	
7 10:07 vecuronium	2 mg	11.0	
8 10:26 fentanyl	50 mcg	150	
9 10:46 vecuronium	2 mg	13.0	
10 10:46 fentanyl	100 mcg	250	
11 11:29 fentanyl	100 mcg	350	*
12 11:31 vecuronium	2 mg	15.00	*
13 11:55 glycopyrrolate	0.6 mg	0.600	*
14 11:55 pyridostigmine	20 mg	20.0	*
15 11:59 ketorolac IM	60 mg	60.0	*
16 12:05 morphine IV	10 mg	10.0	*

EVENTS	
1 09:10	Pre-use Checkout
2 09:20	Start of Anesthesia Care
3 09:20	Patient enters OR
4 09:20	Patient in room, Monitors applied, nasal cannula O2 @ 5 L/min
5 09:20	Patient positioned Supine
6 09:22	Smoth Induction, oral intubation, BLBS w/EEL, +ETCO2, LLOUT,
7 09:23	Precord./Esoph. Stethoscope
8 09:23	Bair Hugger, upper body unit
9 09:25	Humidivent
10 09:35	Prep & Drape
11 09:44	Tournequet UP @
12 09:45	Start of Surgery
13 10:55	DR. ELLIOT AWARE TOUR. TIME 70 MIN.
14 11:43	Tournequet DOWN @
15 11:59	End of Surgery
16 12:00	Awake, suctioned, extubated, good condition
17 12:13	Patient exits OR
18 12:20	End of Anesthesia Care

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Section 5 - Operation
O.R. Data Manager

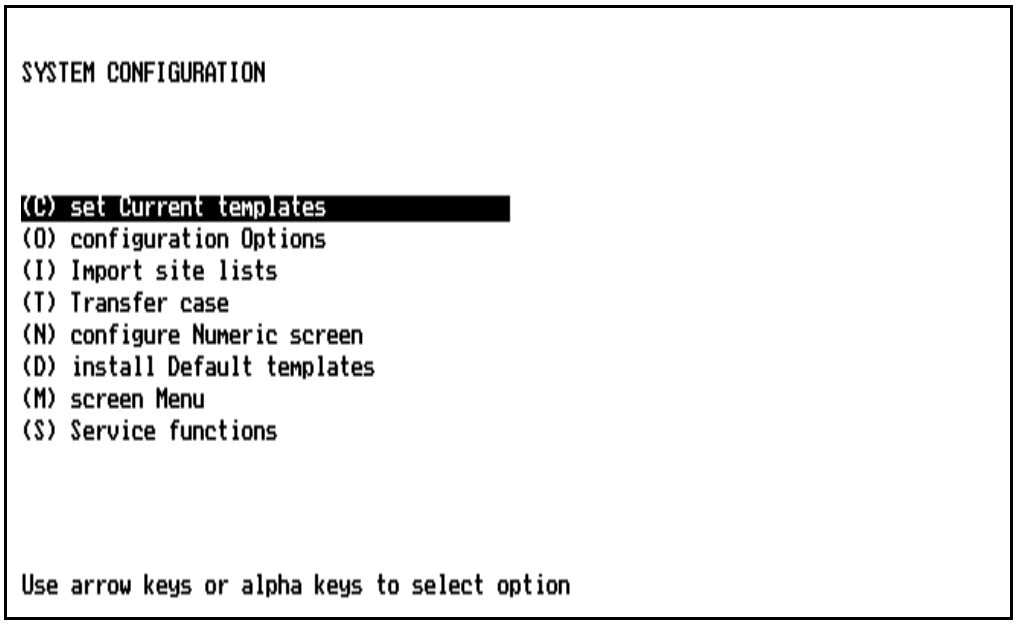
System Configuration Screen

The System Configuration screen contains a menu for selecting configuration subscreens which allow you to customize the operation of the O.R. Data Manager. The screen provides access to the following configuration functions:

- set current drug and event templates
- configure options specific to each O.R. Data Manager
- import site lists
- transfer cases from the O.R. Data Manager hard disk to the network or to a floppy disk
- configure the Numeric Data screen
- install default drug and event templates
- return to the O.R. Data Manager screen menu
- configure the serial port baud rate, configure the O.R. Data Manager as either a network or a floppy disk system, and set the network password. (For use by a North American Dräger qualified technical service representative only.)

Selecting the Screen

To enter the System Configuration screen, press the CONFIG key or use the Datagrip to select CONFIG from the O.R. Data Manager screen menu.



Selecting a Configuration Subscreen

To select a subscreen, press the key letter (for example, press “C” for set Current templates), or highlight the choice and press the ENTER key or the Datagrip trigger.

Set Current Templates Subscreen

The Set Current Templates subscreen is used to load drug and event templates, which are custom lists of drugs and events common in specific types of cases. Using templates permits you to quickly enter information into the Drug Administration and O.R. Event Record screens without having to type all the information. For information on creating templates, see the *PC Prep/View Operator's Manual*.

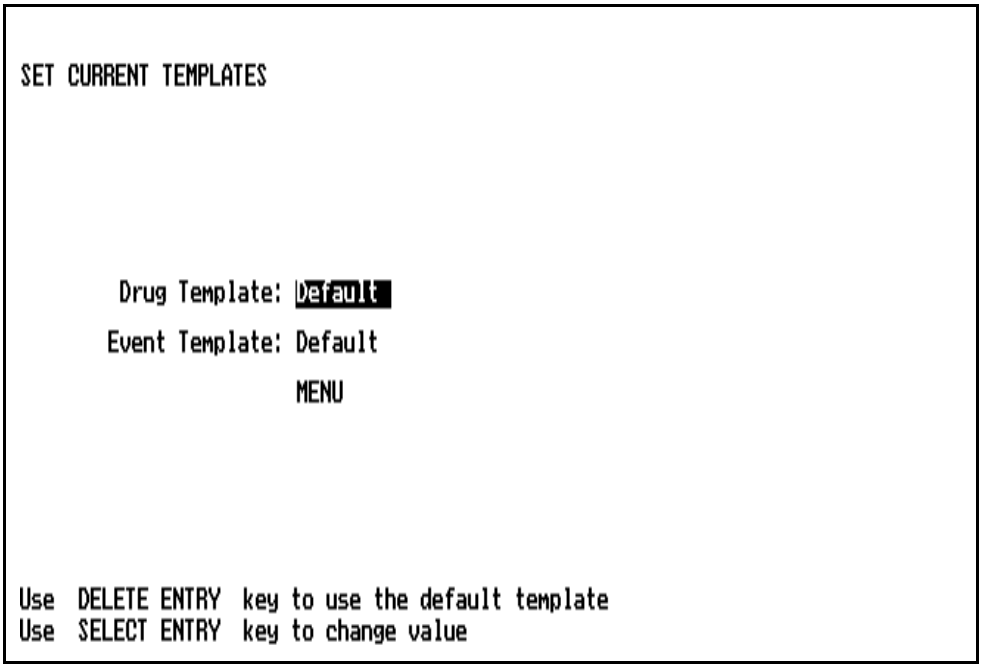
You can load templates into the O.R. Data Manager either from floppy disk or the network, depending on whether your O.R. Data Manager is configured as a floppy disk system or a network system.

If you do not load specific templates, default templates are used.

Selecting the Subscreen

At the System Configuration menu, press "C", or highlight set Current templates and press the ENTER key or the Datagrip trigger. If you are loading from floppy disk, make sure the floppy disk containing the templates is inserted in the disk drive.

When the screen is displayed, the cursor appears in the Drug Template cell.


SET CURRENT TEMPLATES
Drug Template: Default
Event Template: Default
MENU
Use DELETE ENTRY key to use the default template
Use SELECT ENTRY key to change value

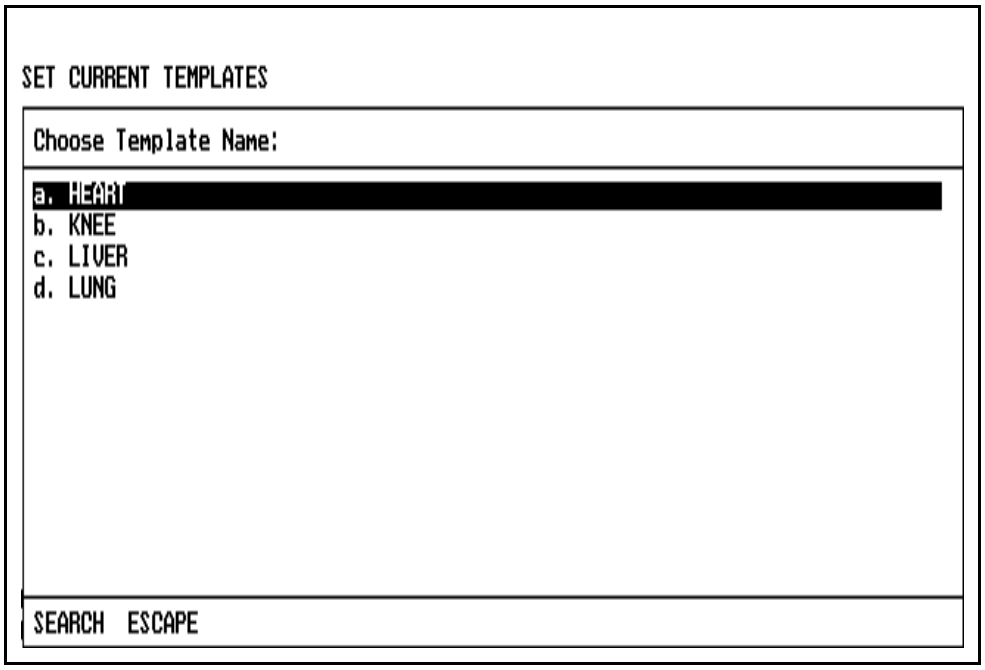
Setting Current Templates

To load a drug or event template from floppy disk or the network:

1. Position the cursor in the desired template cell.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the pop-up list of templates stored on the floppy disk (with floppy disk-based systems) or on the network (with network-based systems).

3. To make a selection, use the procedures described under **Pop-up Menus**.



If you select a drug template, and there is an event template with the same name, and if no event template was previously selected, that template will be automatically set also (and vice versa).

Setting Current Templates to the Default

If you load a specific template from floppy or network, and then subsequently wish to use the default template instead, do the following:

1. Position the cursor in the desired template cell.

2. Press the DELETE ENTRY key. The default template will be automatically loaded.

Returning to the O.R. Data Manager Screen Menu

Position the cursor on the word MENU, and press the Datagrip trigger or the SELECT ENTRY key.

Configuration Options Subscreen

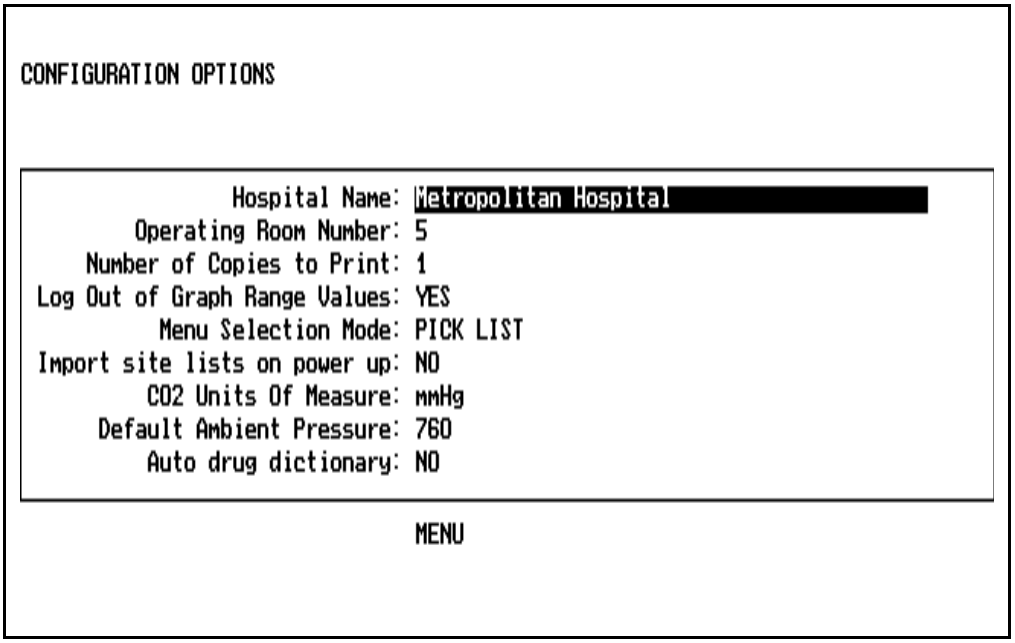
The Configuration Options subscreen allows you to set the following:

- Hospital Name and O.R. number
- Number of Anesthesia Record Copies to Print
- Whether to Log Out of Graph Range Values (yes/no)
- Menu Selection Mode (Single Entry or Pick List)
- Whether to import site lists on power-up (network system only)
- Units of measure for displaying CO_2 values
- Default Ambient Pressure
- Whether to use the auto drug dictionary feature

Selecting the Subscreen

At the System Configuration menu, press “O”, or highlight configuration Options and press the ENTER key or the Datagrip trigger.

When the screen is displayed, the cursor appears in the Hospital Name cell.


CONFIGURATION OPTIONS
Hospital Name: Metropolitan Hospital
Operating Room Number: 5
Number of Copies to Print: 1
Log Out of Graph Range Values: YES
Menu Selection Mode: PICK LIST
Import site lists on power up: NO
CO2 Units Of Measure: mmHg
Default Ambient Pressure: 760
Auto drug dictionary: NO
MENU

Entering the Hospital Name

To enter the hospital name, position the cursor on the Hospital Name cell and type in the name. If there is an existing entry, you may type over it. The hospital name entered here will appear on the Anesthesia Record.

Entering the Operating Room Number

Position the cursor on the Operating Room Number cell and type in up to four alphanumeric characters. If there is an existing entry, you may type over it.

The Operating Room Number will appear on the Patient Data screen and on the Anesthesia Record.

Setting Number of Print Copies

The Print Copies Configuration setting allows you to set how many copies of the Anesthesia Record are to be printed every time you use the O.R. Data Manager Print function.

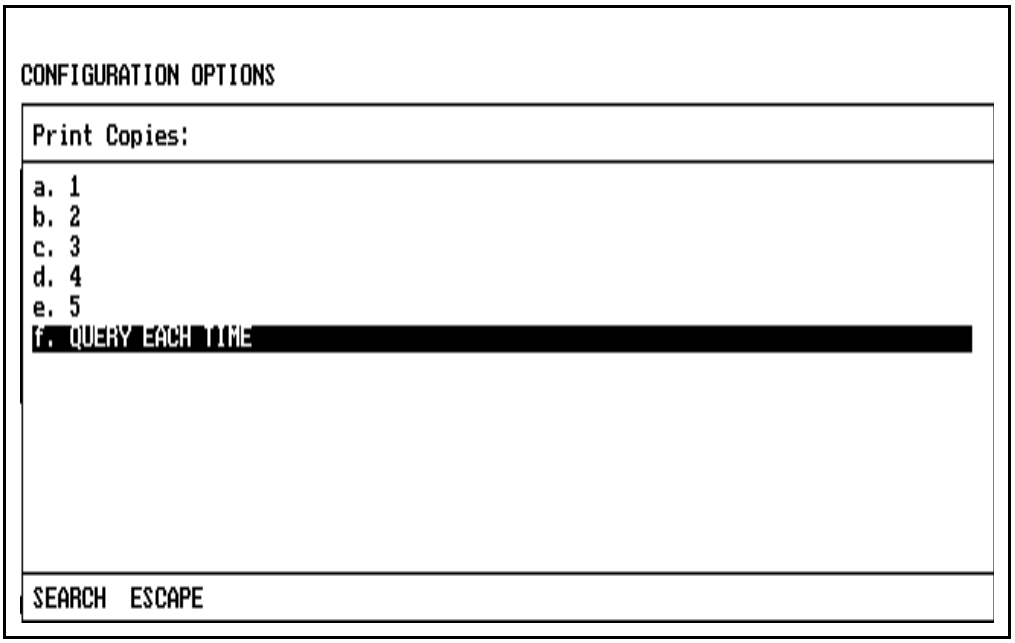
You can specify up to five copies of the Anesthesia Record to be printed automatically each time you print, or you can have the O.R. Data Manager prompt for the number of copies each time you print.

To set the number of print copies:

1. In the Configuration Options subscreen, position the cursor at the Number of Copies to Print cell.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the Print Copies pop-up menu.

3. To make a selection, use the procedures described under **Pop-up Menus**.



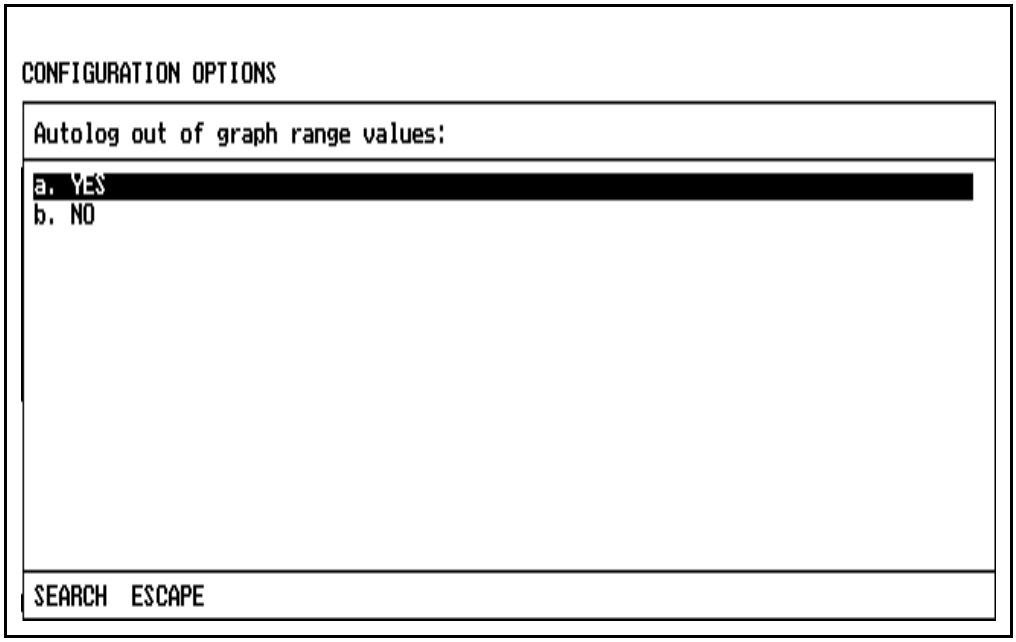
Log Out of Graph Range Values?

When a data value is received over VITALINK that is beyond the range of the corresponding scale on the Graphic History screen, the data will not be plotted. You can, however, choose to have the item automatically logged in the O.R. Event Record screen indicating the time, the variable name (e.g. NIBP Systolic), and the value.

1. In the Configuration Options subscreen, position the cursor at the Log Out of Graph Range Values cell.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the pop-up menu.

3. To make a selection, use the procedures described under **Pop-up Menus**.



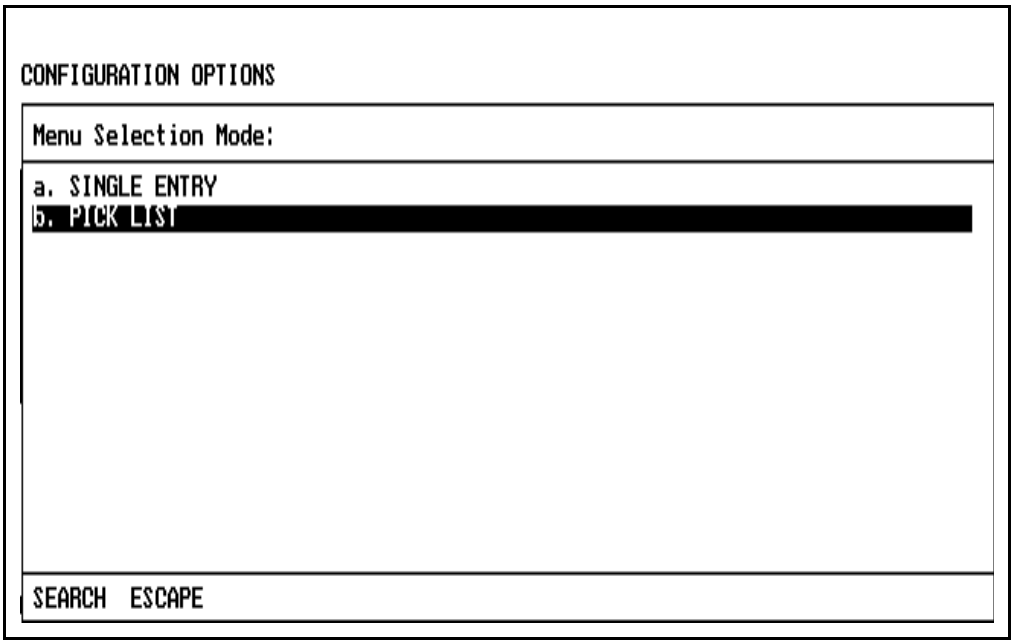
Selecting the Pop-up Menu Display Format

Pop-up menus have two possible display formats: Single Entry and Pick List. In the Single Entry format, only one item can be selected from a displayed list. In the Pick List format, multiple items can be selected (see **Pop-up Menus**). If Single Entry is chosen, all pop-up menus will appear in single entry format. If Pick List is chosen, menus for items which may have multiple selections will appear in pick list format. Items which allow multiple selections include procedure descriptions/codes, staff names and insurance names on the Patient Data screen, drug names on the Drug Administration screen, event descriptions on the O.R. Event Record screen, and numeric item names on the Numeric Data screen. All pop-up menus for items which can only have one choice (e.g. anesthesia type, drug template) will appear in the single entry format, even if the pick list option is chosen.

1. In the Configuration Options subscreen, position the cursor at the Menu Selection Mode cell.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the pop-up menu.

3. To make a selection, use the procedures described under **Pop-up Menus**.



Section 5 - Operation
O.R. Data Manager

Import Site Lists on Power-up Option

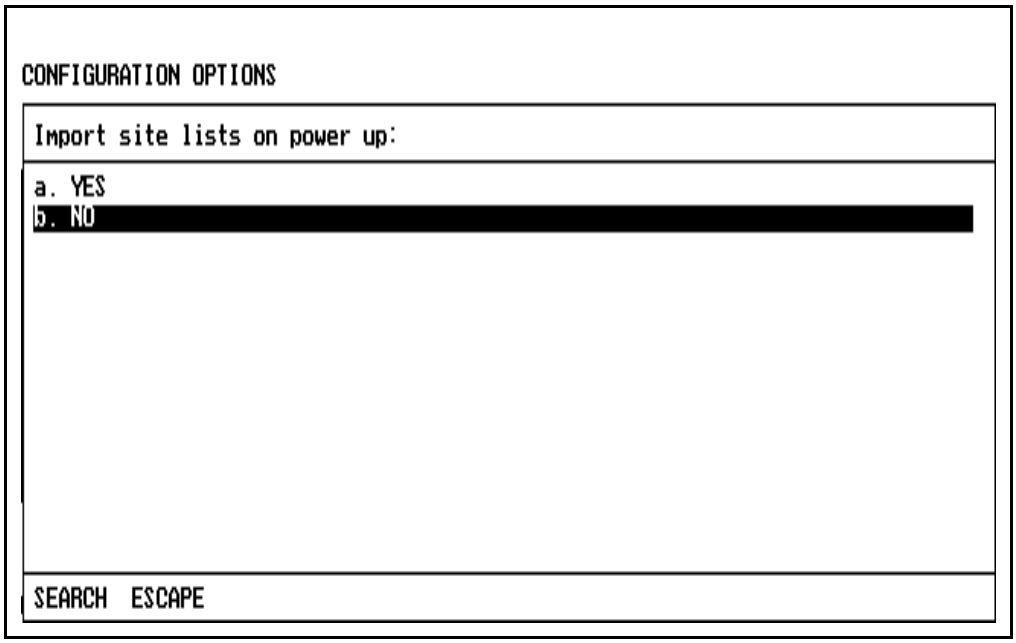
The import site lists on power-up option tells the O.R. Data Manager whether to copy all the site lists from the network to the O.R. Data Manager hard drive each time the O.R. Data Manager is powered on. Setting this option to "YES" ensures that the O.R. Data Manager always has the latest network lists on its hard drive. If this option is set to "NO", the Import Site lists function must be used to copy site lists from the network.

This option will only appear on the Configuration Options subscreen if the system is a network system.

1. In the Configuration Options subscreen, position the cursor at the IMPORT SITE LISTS ON POWER UP cell.

2. Press the SELECT ENTRY key or Datagrip trigger to display the pop-up menu.

3. To make a selection, use the procedures described under **Pop-up Menus**.



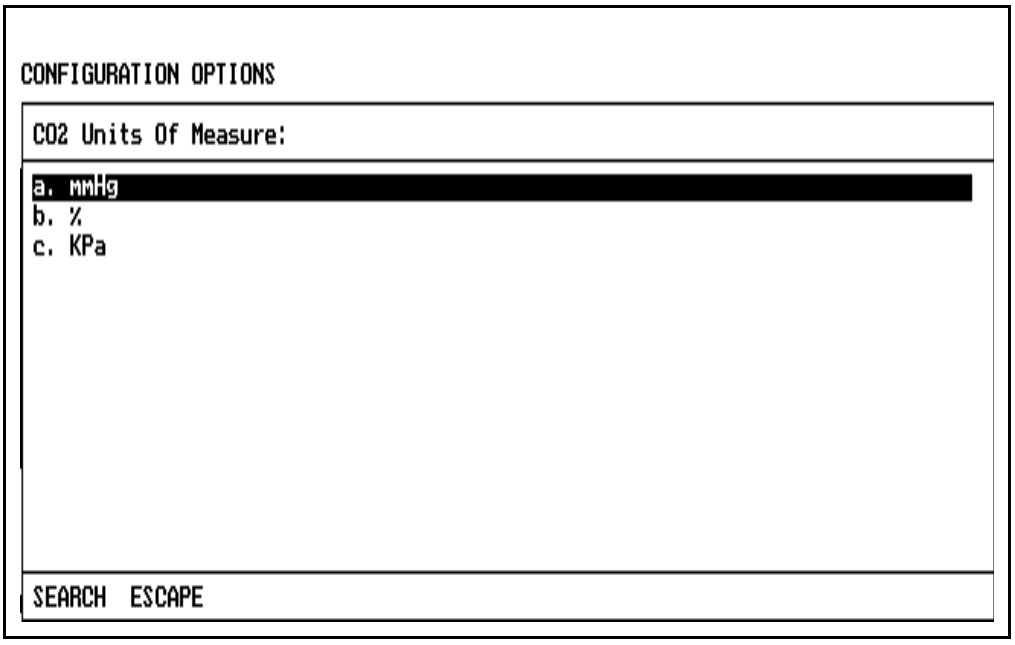
Selecting CO_2 Units of Measure

The CO_2 units of measure selection tells the O.R. Data Manager what units to use when displaying CO_2 on the Monitor screen, the Numeric Data screen, and the printed Anesthesia record.

1. In the Configuration Options subscreen, position the cursor at the CO_2 UNITS OF MEASURE cell.

2. Press the SELECT ENTRY key or Datagrip trigger to display the pop-up menu.

3. To make a selection, use the procedures described under **Pop-up Menus**.



Entering the Default Ambient Pressure

The ambient (atmospheric) pressure is used by the O.R. Data Manager to compute certain CO_2 values displayed on the Monitor and Numeric Data screens. In cases where the monitor on the anesthesia machine supplies an ambient pressure to the O.R. Data Manager, this value is used in the computation. However, some monitors do not supply this value. In these cases, the O.R. Data Manager uses a default ambient pressure to compute the values. The initial default ambient pressure is set to 760 (mm Hg) by the O.R. Data Manager. The user can change this value by positioning the cursor on the DEFAULT AMBIENT PRESSURE cell and typing the desired value over the existing entry. Only numeric values between 500 and 850 inclusive will be accepted for this cell.

Auto Drug Dictionary Option

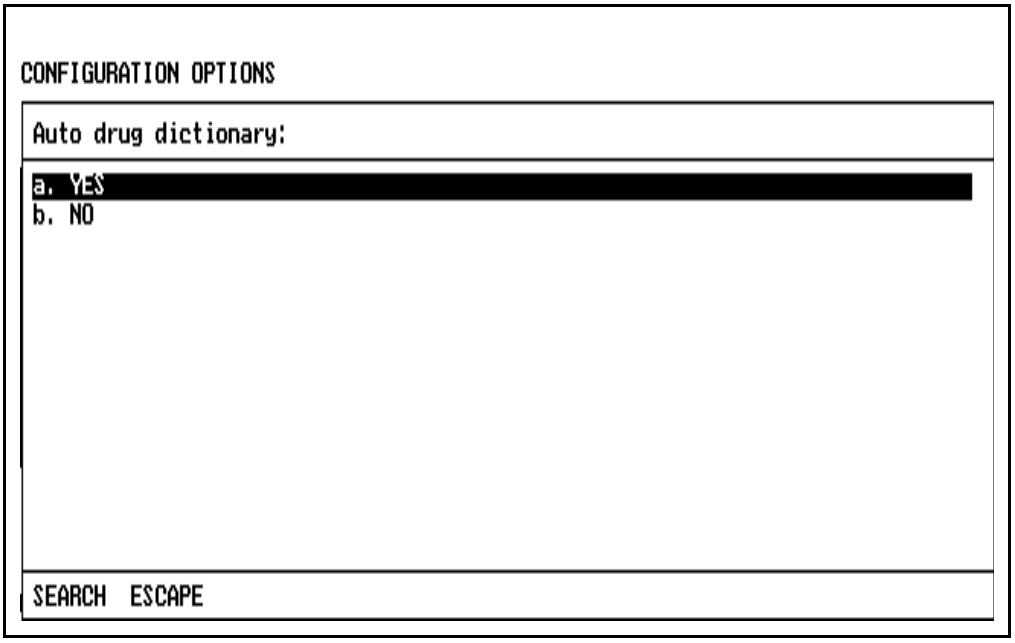
If the Auto Drug Dictionary option is set to "YES", the O.R. Data Manager will automatically complete drug names typed from the keyboard on the Drug Administration and Numeric Data screens as soon as the user enters a string that uniquely identifies a drug in the Drug Dictionary. If the drug name is in the drug template, any units and routes specified in the drug template will also be automatically entered. Otherwise, the units from the Drug Dictionary will be automatically entered. (The Drug Dictionary does not contain routes.)

This feature is useful for ensuring that drug names are spelled correctly and are consistent from record to record.

1. In the Configuration Options subscreen, position the cursor at the AUTO DRUG DICTIONARY cell.

2. Press the SELECT ENTRY key or Datagrip trigger to display the pop-up menu.

3. To make a selection, use the procedures described under **Pop-up Menus**.



Editing Data

The Edit Mode allows editing of the Hospital Name, Operating Room Number, and Default Ambient Pressure cells. Refer to **General Operation,** Edit Mode for use of the edit window.

Returning to the O.R. Data Manager Screen Menu

To return to the O.R. Data Manager screen menu, position the cursor on the word MENU and press the Datagrip trigger or the SELECT ENTRY key.

Saving the Configuration Options

To save the hospital name, number of print copies, and other configuration settings, you must exit the Configuration Options subscreen. To exit the screen, press any of the other screen keys or the CONFIG key, or use the Datagrip to select any other option from the O.R. Data Manager screen menu. If you made any changes, they are saved to the O.R. Data Manager hard disk when you exit the screen.

Import Site Lists Subscreen

The Import Site Lists subscreen allows you to install on the O.R. Data Manager the site-configurable lists created using the PC Prep/View software program. You can configure and import the following types of lists:

- Surgeon names
- Anesthesia types
- Units of measure
- Numeric items and defaults
- QA Indicators
- Insurance names
- Procedures and associated numeric codes
- Event sublists (Intubation, Patient Position, Billable Items, Miscellaneous)
- Automatically entered Start/Stop events and their time offsets (one list)
- Anesthetist names
- Drug Dictionary
- Drug Administration Routes
- ECG heart rhythms
- Anesthesiologist names

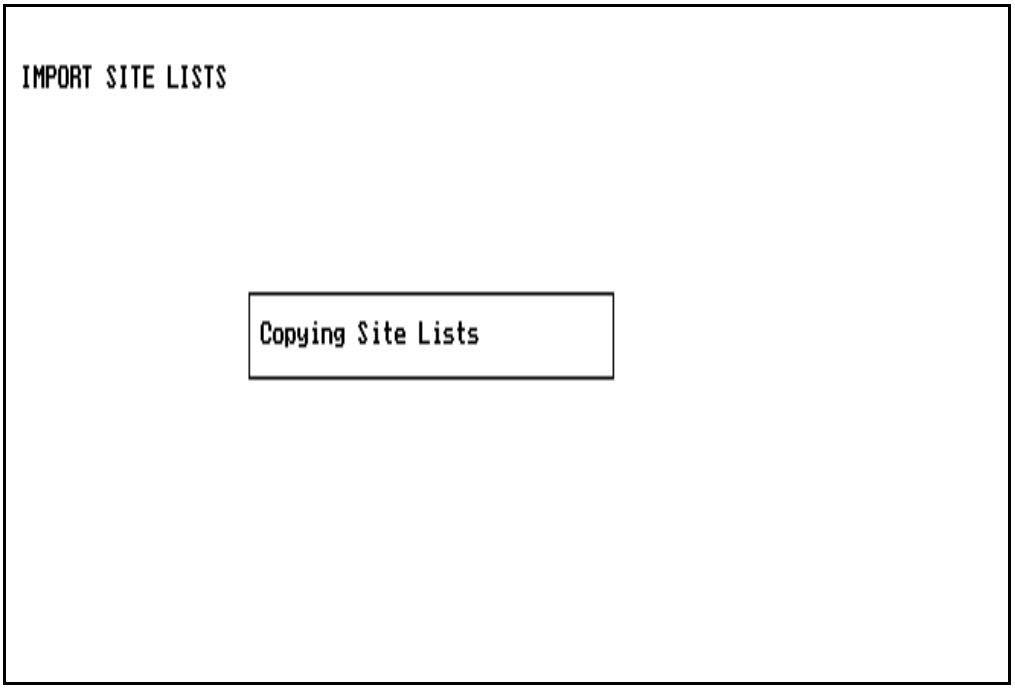
Default lists are provided for anesthesia types, Drug Dictionary, units of measure, drug administration routes, numeric items, numeric defaults, ECG rhythms, event sublists, Start/Stop events and offsets, QA indicators and insurance names if none are configured by the user.

You cannot import site lists while data is being recorded.

If a network system is installed, the O.R. Data Manager can be configured to import site lists automatically on power-up. For more information on site-configurable lists, see the *PC Prep/View Operator's Manual*.

Selecting the Subscreen

At the System Configuration screen, press “I”, or highlight Import site lists and press the ENTER key or the Datagrip trigger. If you have a network-based system, the site lists are then copied. If you have a floppy disk-based system, you will first be prompted to insert the disk containing the site-configurable lists and press any key to continue; the site lists will then be copied.



Once the site lists are loaded on the O.R. Data Manager hard drive and into O.R. Data Manager memory, you are returned to the System Configuration Screen.

Transfer Case Subscreen

The Transfer Case subscreen allows you to copy cases from the hard disk drive to a floppy disk and, on network-based systems, to a network drive.

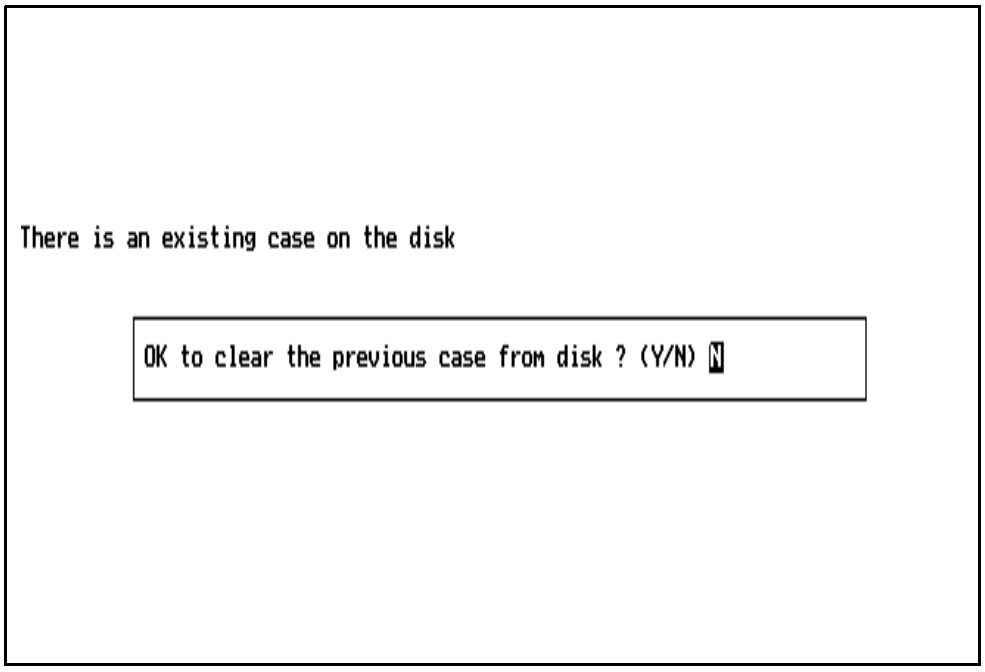
You cannot transfer cases while data is being recorded.

Selecting the Subscreen

At the System Configuration screen, press “T”, or highlight Transfer case and press the ENTER key or the Datagrip trigger.

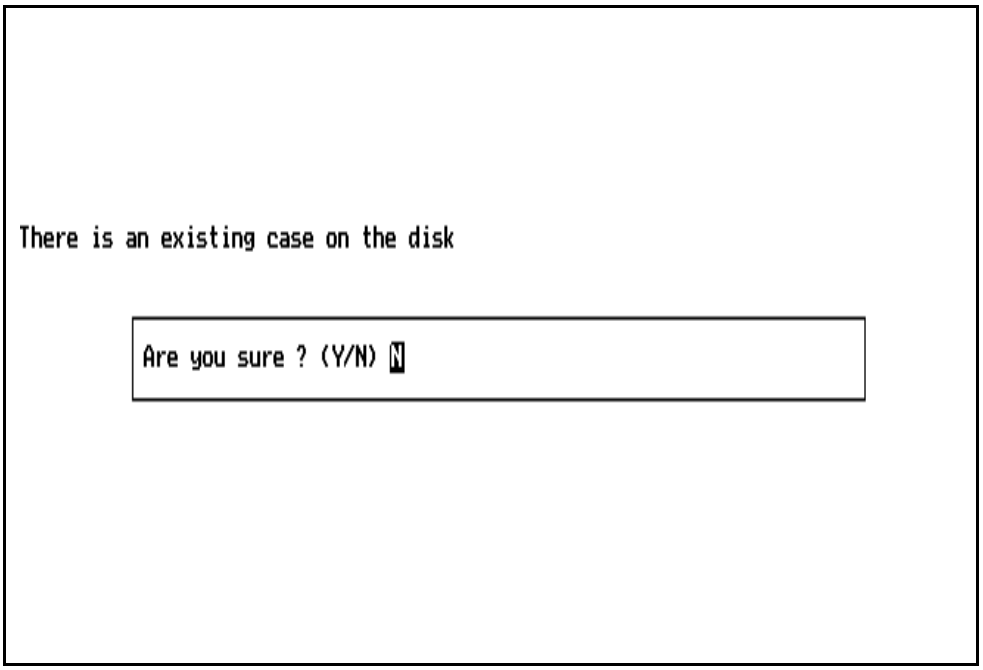
Floppy Disk-Based Systems

After you select Transfer case from the System Configuration screen, you are prompted to insert the disk. When the disk is inserted, it is checked for existing case data. If it contains case data, the following prompt to clear data appears on the screen:



- If you want to clear all case data contained on the floppy disk, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- If you do not want to clear existing case data, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger. You will then have to remove or replace the disk.

If you specify Y, a second prompt appears to confirm your choice:

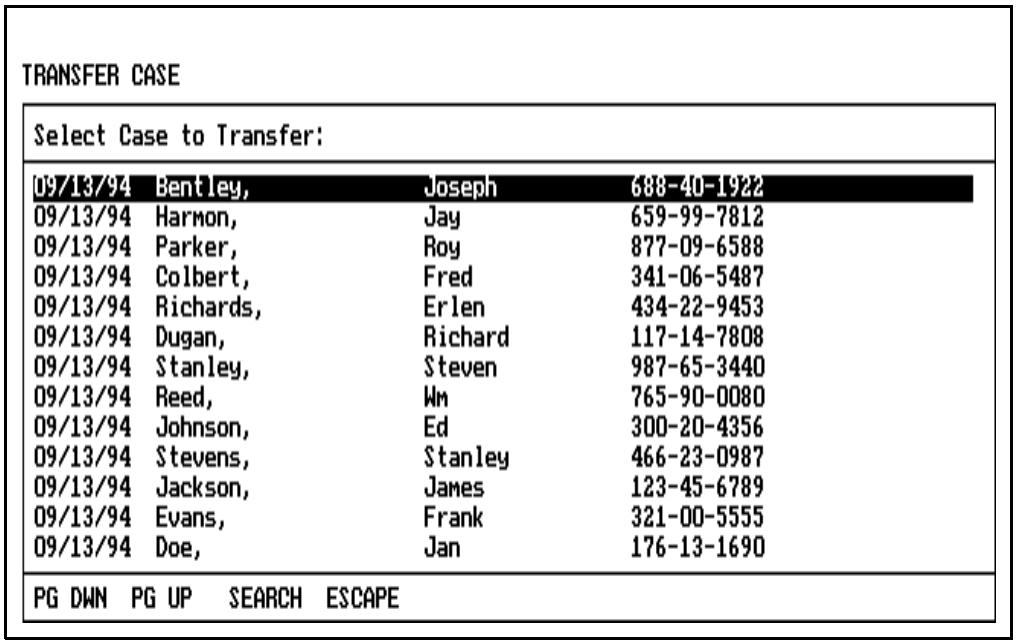


- If you want to clear case data from the disk, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- If you do not want to clear case data from the disk, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger. You will then have to remove or replace the disk.

If you do not respond within 30 seconds, the case data is not cleared and the prompt is removed from the screen. If you respond with a Y to the confirmation prompt, the program will clear case data.

Copying From Hard Disk to Floppy

When the disk is cleared, you are prompted to select the case from a pop-up list of cases that are found on the hard disk:



Select the case to copy using the procedures outlined under **Pop-up Menus**.

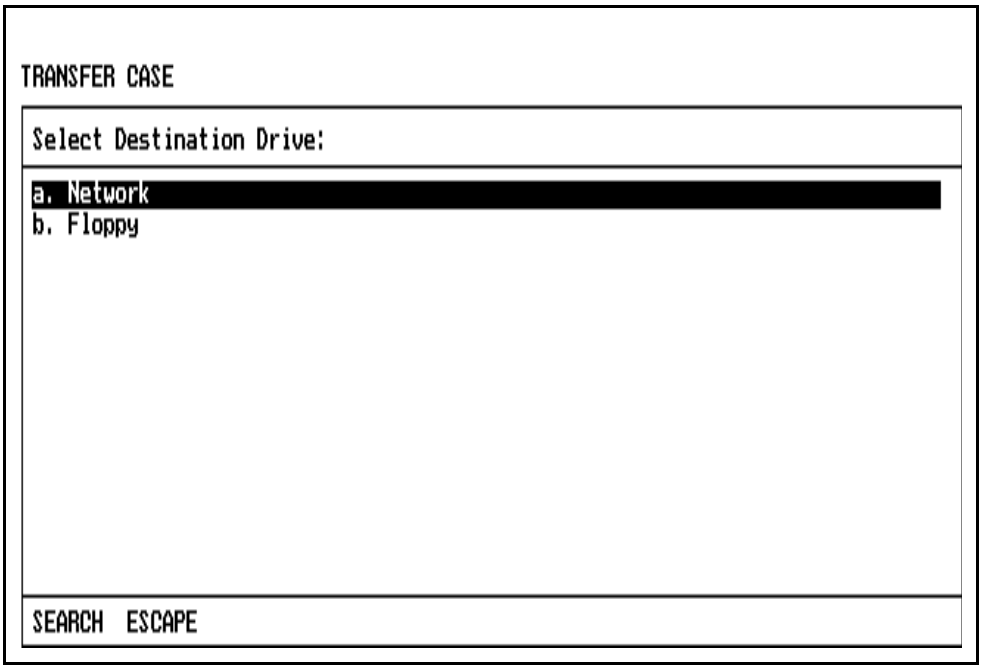
The message "Copying case to Floppy" is displayed. When the case is copied, you are returned to the System Configuration screen.

NOTE: The most recent 100 cases are always saved on the hard disk.

Network-Based Systems

On a network-based system, you can copy cases from the hard disk drive to either the network disk or to the floppy disk.

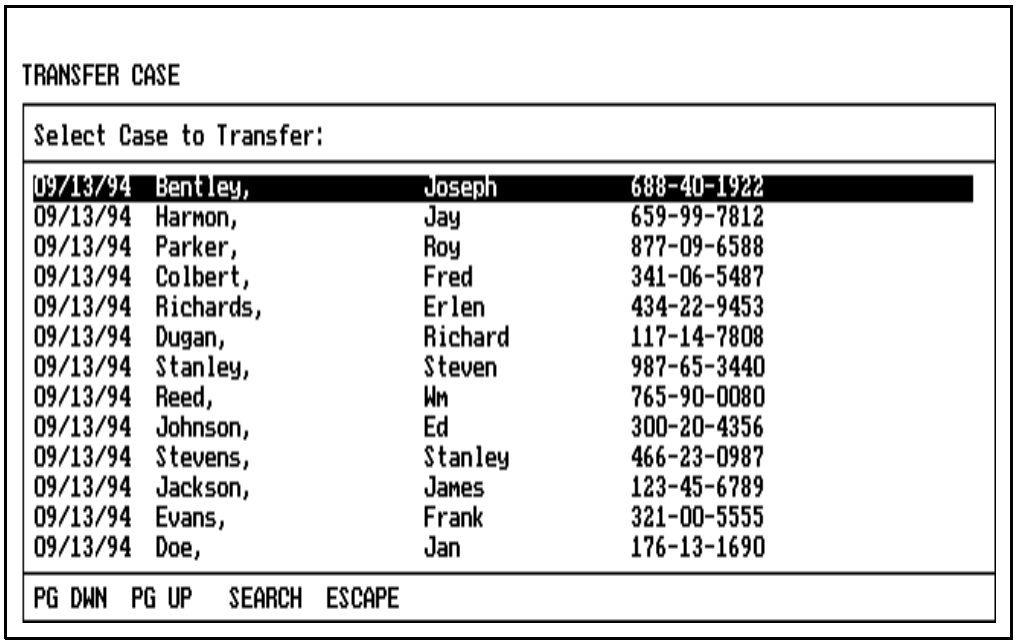
After you select Transfer case from the System Configuration menu, you are prompted to select what drive you want to copy to:



To select the drive, use the procedures described under **Pop-up Menus**.

Copying From Hard Disk to Network

If you select the network drive, you are then prompted to select the case from a pop-up list of cases that are found on the hard disk:



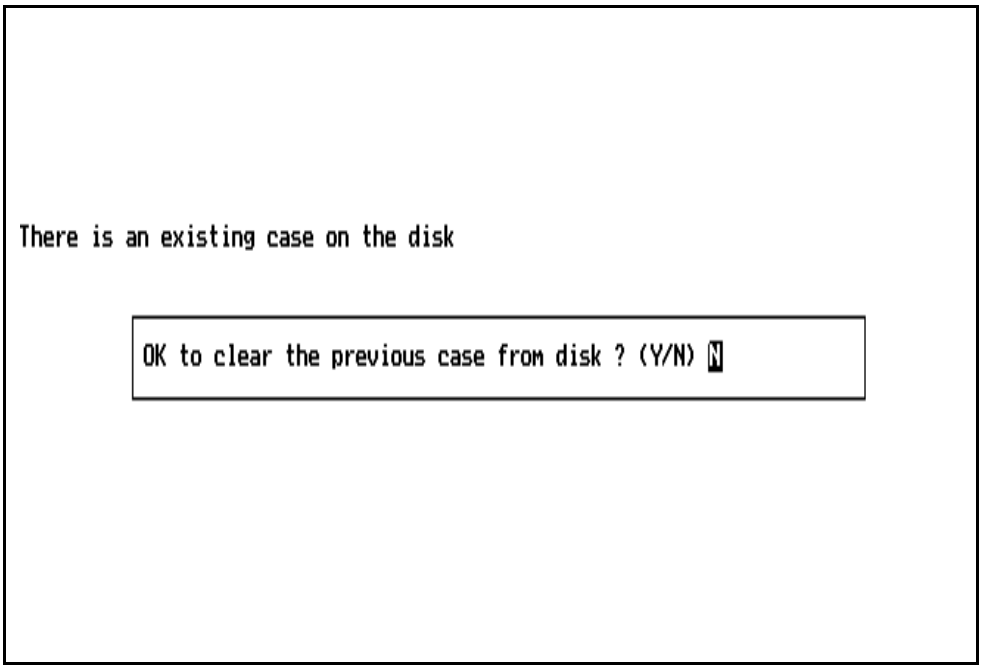
Select the case to copy using the procedures outlined under **Pop-up Menus**.

The message “Copying case to Network” is displayed. When the case is copied, you are returned to the System Configuration screen.

NOTE: The most recent 100 cases are always saved on the hard disk.

Copying From Hard Disk to Floppy (Network-Based Systems)

If you select the floppy drive, you are prompted to insert the disk. When the disk is inserted, it is checked for existing case data. If it contains case data, the following prompt to clear data appears on the screen:

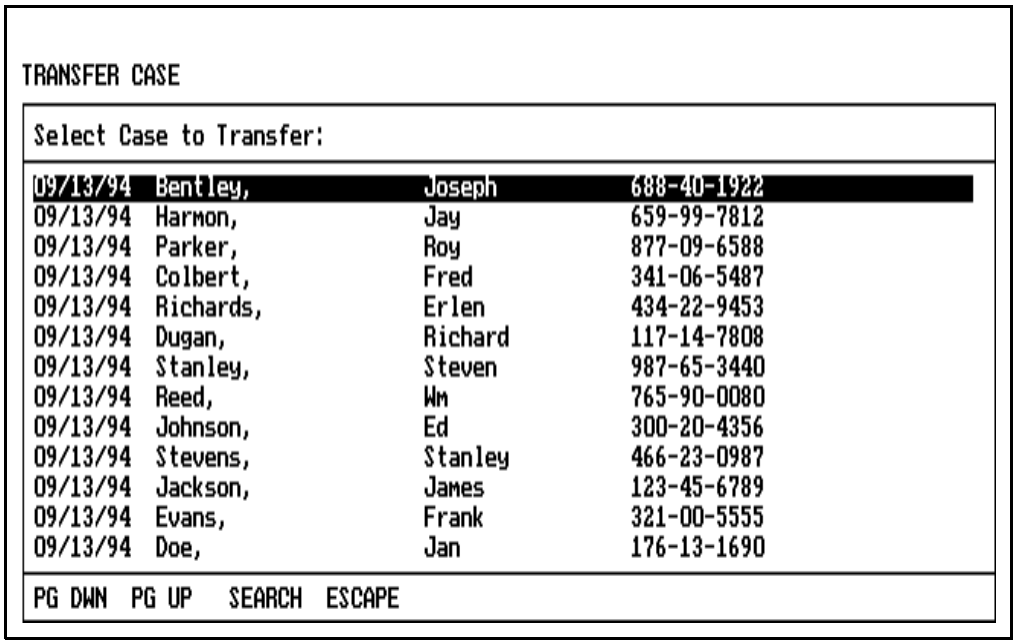


- If you want to clear all case data contained on the floppy disk, press the Y key, or rotate the thumbwheel to display Y and press the Datagrip trigger.
- If you do not want to clear existing case data, press N or any key other than Y, or rotate the thumbwheel to display N and press the Datagrip trigger. You will then have to remove or replace the disk.

If you specify Y, a confirmation prompt “Are you sure ? (Y/N)” appears; respond accordingly.

If you do not respond within 30 seconds, the case data is not cleared and the prompt is removed from the screen. If you respond with a Y to the confirmation prompt, the program will clear case data.

When the disk is cleared, you are prompted to select the case from a pop-up list of cases that are found on the hard disk:



Select the case to copy using the procedures outlined under **Pop-up Menus**.

The message "Copying case to Floppy" is displayed. When the case is copied, you are returned to the System Configuration screen.

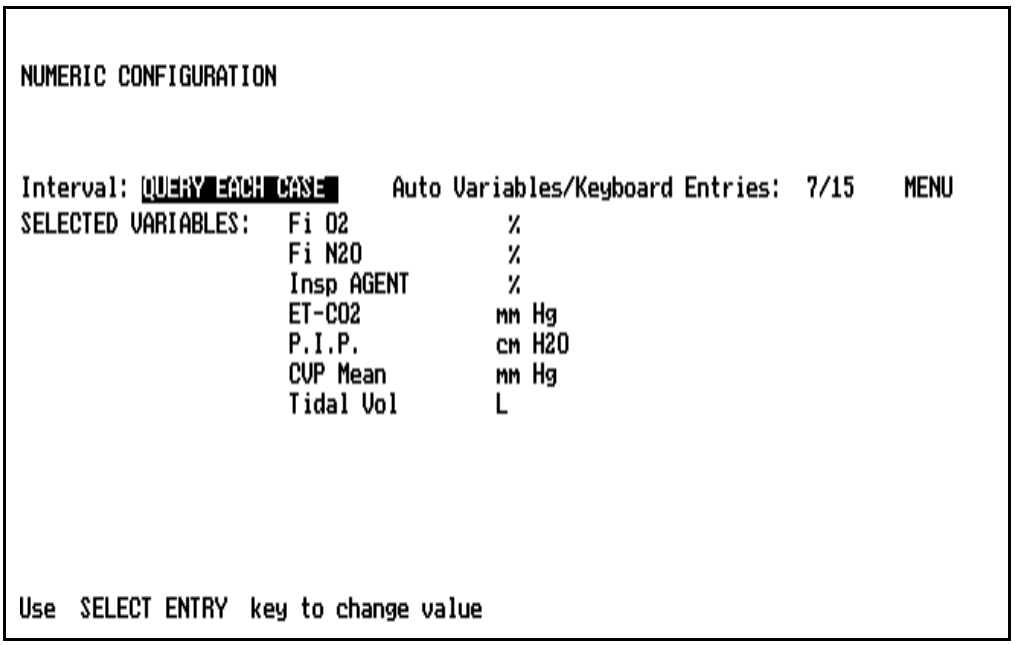
NOTE: The most recent 100 cases are always saved on the hard disk.

Configure Numeric Screen Subscreen

The Configure Numeric Screen subscreen allows you to select the time interval for data to be posted in the Numeric Data screen and the anesthesia record, and the number and type of variables that will appear on the upper portion of the Numeric Data Screen, and on the anesthesia record.

Selecting the Subscreen

In the System Configuration screen, type 'N' or position the cursor on configure Numeric Screen and press the SELECT ENTRY key or the Datagrip trigger to display the Configure Numeric Screen subscreen.



Selecting the Numeric Screen Time Interval

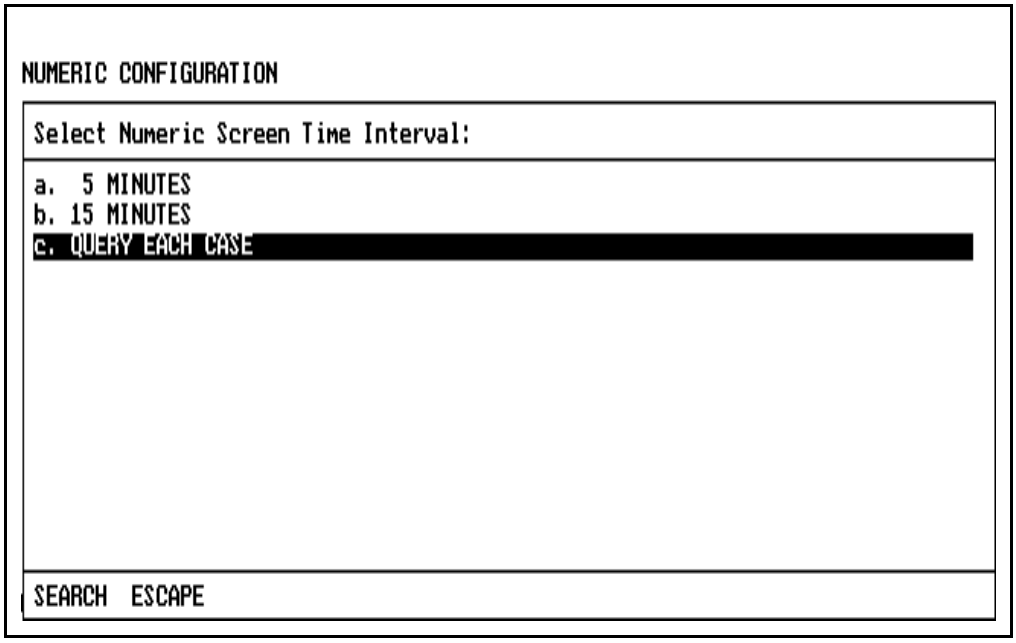
This option allows you to set the time interval for data to be posted in the Numeric Data screen and on the anesthesia record. You can choose either 5 or 15 minute intervals. The 5 minute interval is recommended for shorter cases (less than 2-3 hours), and the 15 minute interval is recommended for longer cases.

A third selection, QUERY EACH CASE, will allow you to make the time interval selection at the start of a case (see **Starting a Case**).

1. In the Configure Numeric Screen subscreen, position the cursor at the Interval cell.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the pop-up menu.

3. To make a selection, use the procedures described under **Pop-up Menus**.



During a case, the time interval can only be changed if the interval is set to 15 minutes, that is, if 15 minutes was chosen for the interval value on the Configure Numeric Screen subscreen, or 15 minutes was selected by the user at the case start. The interval CANNOT be changed from 5 minutes to another value during a case, even if the interval was originally 15 minutes when the case was started.

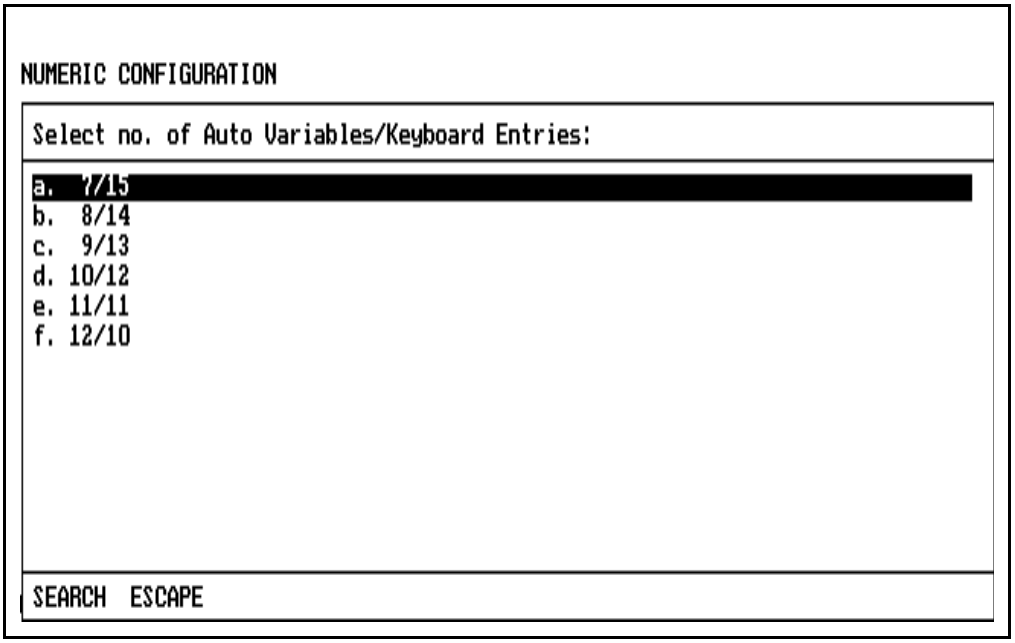
Selecting Number of Automatic Variables/ Keyboard Entries

The number of automatic variables/keyboard entries tells how the Numeric Screen is to be split between automatically recorded variables (top portion of the screen) and keyboard-entered variables (bottom portion of the screen). A maximum of 22 variables may be displayed on the screen. Of these 22, up to 12 may be automatically recorded variables.

1. In the Configure Numeric Screen subscreen, position the cursor at the AUTO VARIABLES/KEYBOARD ENTRIES cell.

2. Press the SELECT ENTRY key or the Datagrip trigger to display the pop-up menu.

3. To make a selection, use the procedures described under **Pop-up Menus**.

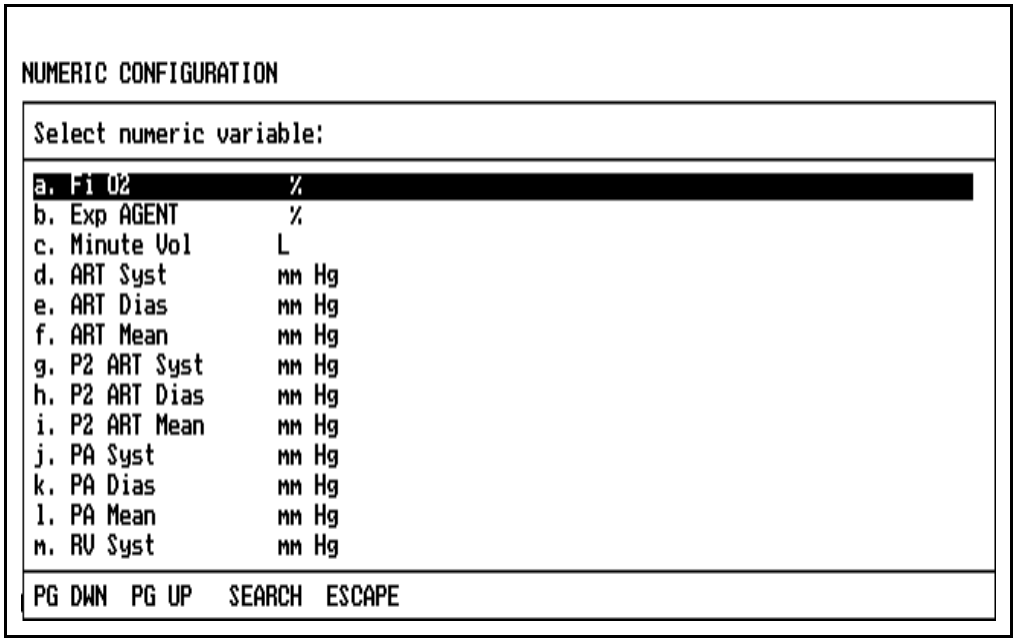


Slots for numeric variable names on the Configure Numeric Screen subscreen will increase/decrease automatically if the number of automatic variables is changed.

Selecting the Numeric Variables

For each selected variable slot in the Configure Numeric Screen subscreen, a menu of choices appears when the SELECT ENTRY key or Datagrip trigger is pressed.

To select a numeric variable, use the procedures outlined under **Pop-up Menus**.


NUMERIC CONFIGURATION
Select numeric variable:
a. Fi O2 %
b. Exp AGENT %
c. Minute Vol L
d. ART Syst mm Hg
e. ART Dias mm Hg
f. ART Mean mm Hg
g. P2 ART Syst mm Hg
h. P2 ART Dias mm Hg
i. P2 ART Mean mm Hg
j. PA Syst mm Hg
k. PA Dias mm Hg
l. PA Mean mm Hg
m. RV Syst mm Hg
PG DWN PG UP SEARCH ESCAPE

Returning to the O.R. Data Manager Screen Menu

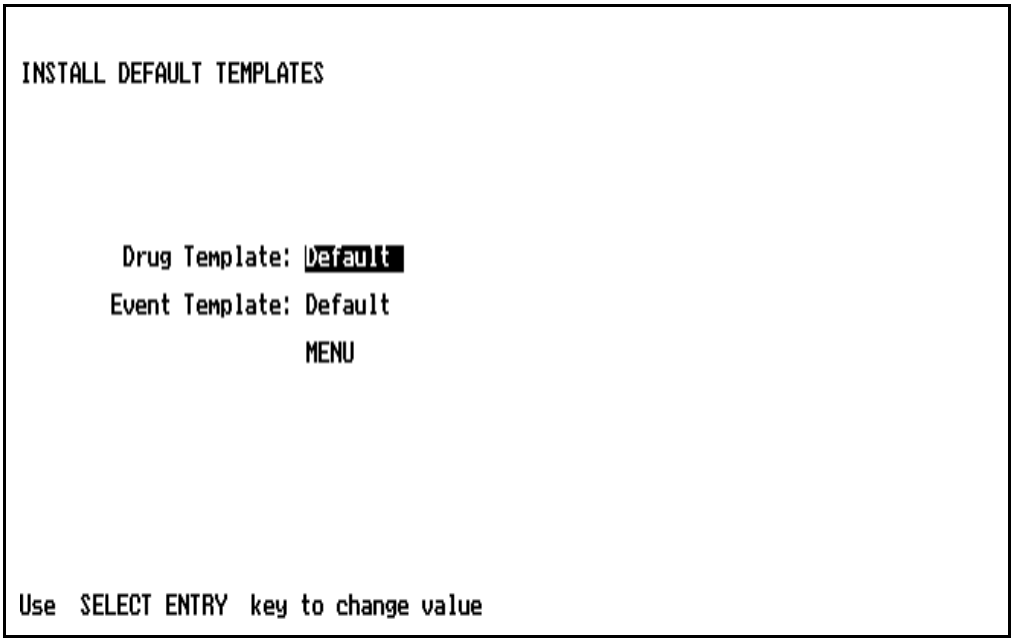
To return to the O.R. Data Manager screen menu, position the cursor on the word MENU and press the Datagrip trigger or the SELECT ENTRY key.

Install Default Templates Subscreen

This subscreen allows installation of preconfigured Drug and Event templates as the default templates.

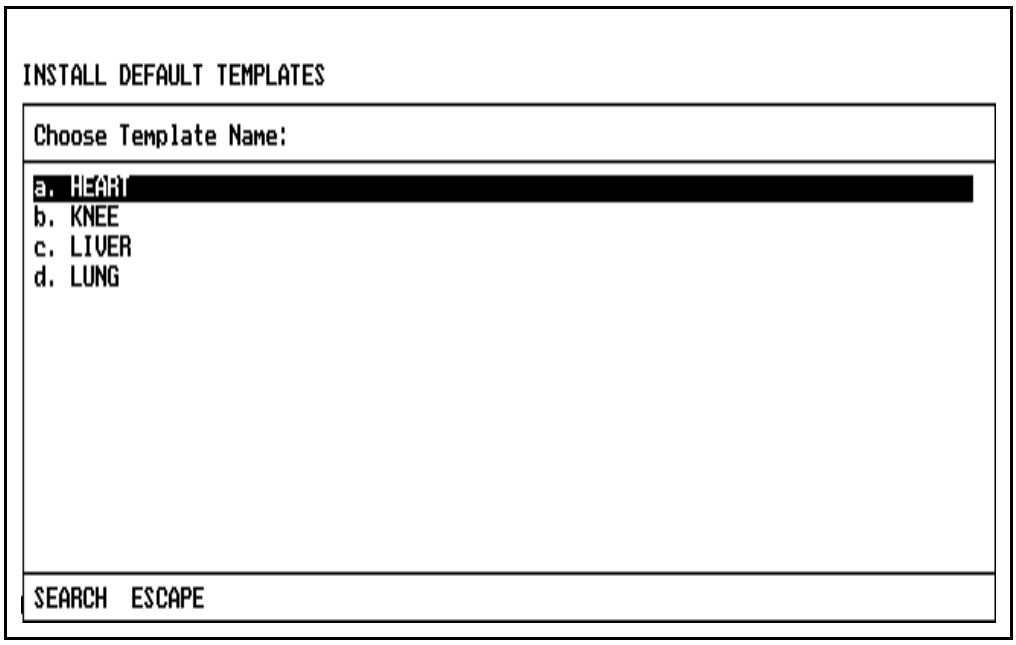
Selecting the Subscreen

In the System Configuration screen, type 'D' or position the cursor on install Default templates and press the SELECT ENTRY key or the Datagrip trigger to display the Install Default Templates subscreen.



Selecting the Templates

With the Drug Template or the Event Template field highlighted, press the SELECT ENTRY key to bring up the Default Templates pop-up menu.



Select the template using the procedures described under **Pop-up Menus**.

If you select a drug template, and there is an event template with the same name, and if no event template was previously selected, that template will be automatically selected also (and vice versa).

The newly installed default templates also become the currently selected templates.

Returning to the O.R. Data Manager Screen Menu

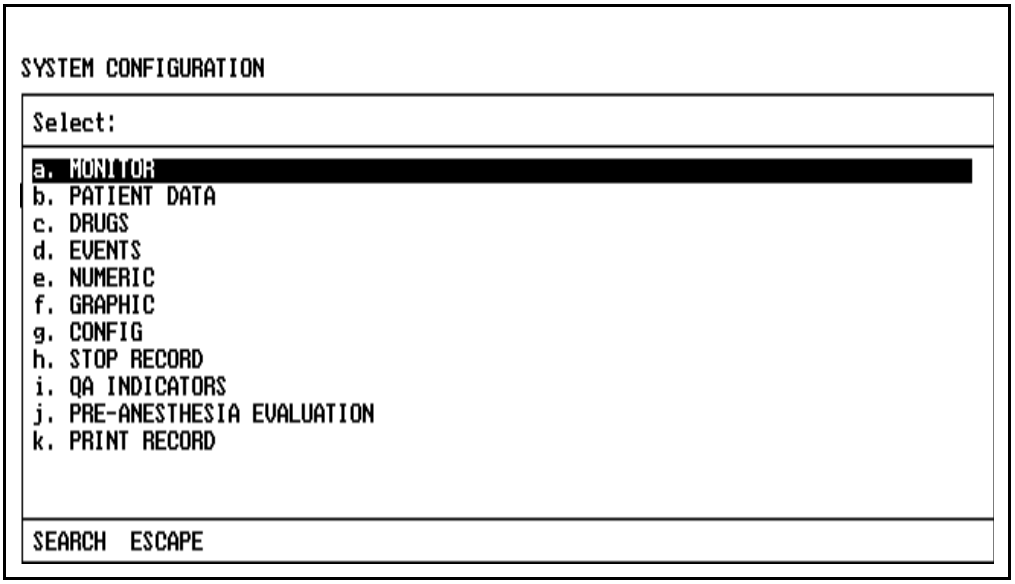
To return to the O.R. Data Manager screen menu, position the cursor on the word MENU and press the Datagrip trigger or the SELECT ENTRY key.

Screen Menu Subscreen

In addition to selecting O.R. Data Manager screens using the keyboard, you can select them from a pop-up screen menu. The menu lists all the O.R. Data Manager screens along with an option to start or stop recording data.

Selecting the Screen Menu Subscreen

At the System Configuration screen, press “M”, or highlight screen Menu and press the ENTER key or the DATAGRIP trigger.



This menu allows entry into other screens, and the STOP RECORD option allows you to stop recording. (If the O.R. Data Manager is not recording, the option will be shown as START RECORD, allowing you to start recording of data.)

Make the desired selection using the procedures described under **General Operation** and **Pop-up Menus.**

Exiting the Screen

To exit the screen, press any of the other Screen keys, or use the Datagrip to select any other option from the O.R. Data Manager screen menu.

Service Functions Subscreen

The Service functions subscreen of the System Configuration screen is used to configure the O.R. Data Manager as either a network or a floppy disk-based system, set the baud rate for data communication, and set the network password. It is accessible only via a password and is to be used only by a North American Dräger qualified technical service representative.

Section 5 - Operation
O.R. Data Manager

ATTACHMENT

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Section 6
Routine Maintenance and Cleaning

Overview

This section outlines procedures for maintaining and cleaning the Narkomed 4.

Routine Maintenance

Routine maintenance must be performed regularly to ensure safe and effective operation. Regularly check the condition of the absorbent and the overall condition of the machine, power cord, hoses, and breathing bag.

Replacing the Absorbent

When the carbon dioxide absorbent in the absorber system is exhausted, it must be replaced. Refer to the manufacturer's instructions for the signs to expect when the absorbent is exhausted.

If the machine has been out of use or in storage, replace the absorbent before using the machine. North American Dräger recommends establishing a routine schedule with a sufficient safety margin for replacing absorbent.

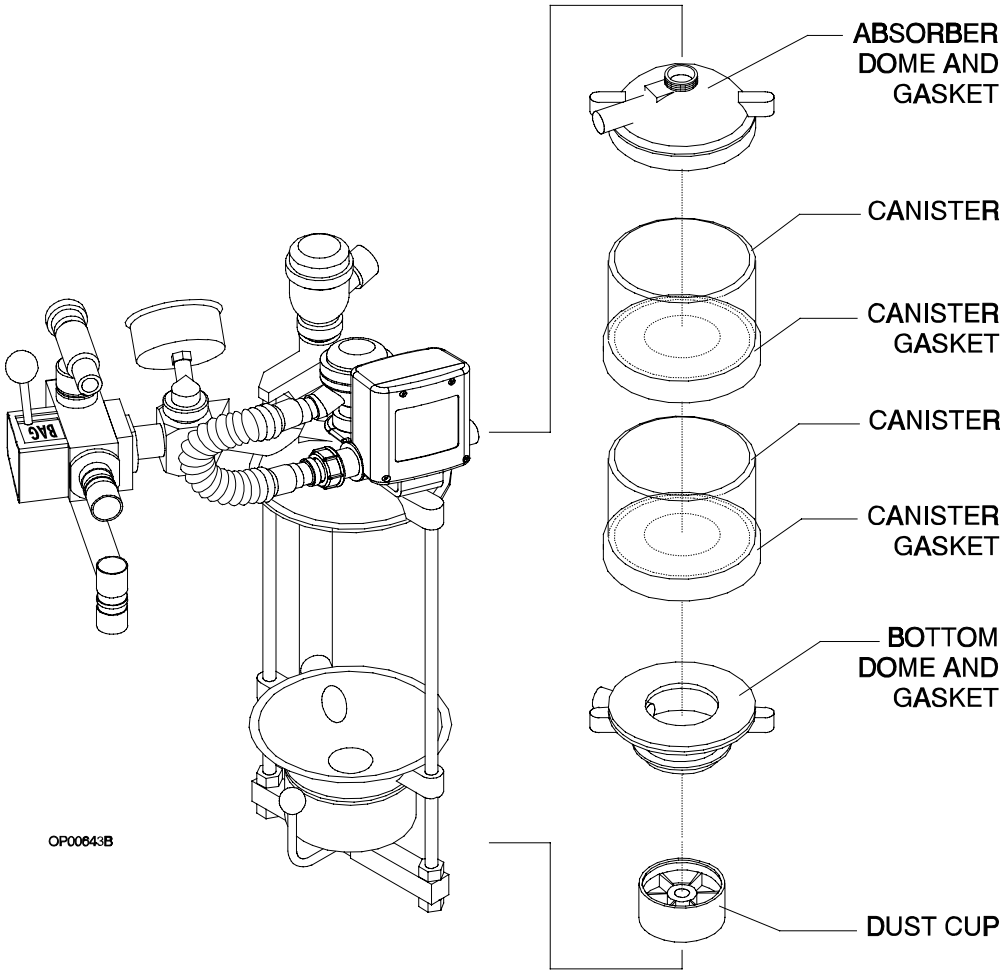
When using loose absorbent, do not fill above the maximum fill level line located about a quarter-inch from the top of the canister. The clearance and the ratio of canister diameter to screen opening minimize the potential for channeling. In channeling, gas flows through the canister along the path of least resistance. The gas depletes the efficiency of the absorbent along this route, bypassing absorbent in the other areas of the absorber.

WARNING: Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When replacing the absorbent, take care not to spill its caustic contents.

To replace the absorbent:

1. Pull the canister release lever down.
2. Remove the canisters from the absorber system.
3. Empty the contents of the canisters into an appropriate refuse container.
4. Check the canisters to make sure they are not chipped or cracked.

Section 6
Routine Maintenance and Cleaning



5. Taking care not to chip or crack the canisters, add new absorbent to each one.

   - When using absorbent prepacks, remove all packaging materials (some have clear plastic wrappers) and place a prepack into each canister.

   - When using loose absorbent, fill the canister to the fill line. Do not overfill.

6. Stack one canister on top of the other and center the stack on the gasket of the bottom dome.

7. Raise the bottom dome, remove and empty the dust cup if loose absorbent is present, and replace the dust cup.

8. Pull the canister release lever up to close the absorber system.

9. Perform the absorber portion of the daily checkout procedure provided in the "Daily Checkout" section to verify proper reassembly.

Replacing the Oxygen Sensor

Replace the oxygen sensor capsule when its sensor is depleted, because a depleted sensor cannot correctly analyze oxygen concentrations.

1. Turn the SYSTEM POWER switch to STANDBY.

2. Remove the oxygen sensor housing from the inspiratory valve dome. (It is a press fit.)

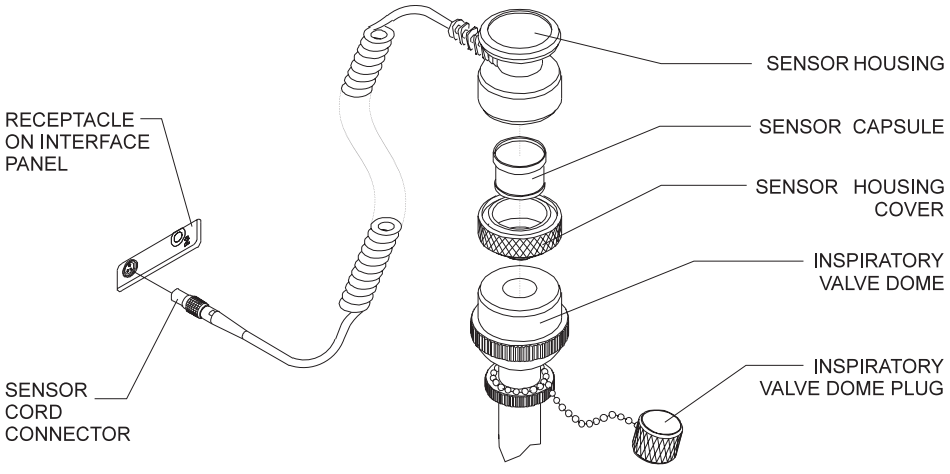
3. Unscrew the cover from the sensor housing and remove the sensor capsule.

4. Install the replacement sensor in the housing. Verify that the copper rings on the capsule mate with the electrical contacts in the sensor housing.

5. Wait 15 minutes to let the sensor capsule stabilize to ambient air.

   If you do not wait, calibration (the next step) will not be successful.

6. Restore power to the machine and calibrate the oxygen sensor, as described in Section 5, "Operation, Oxygen Monitoring."



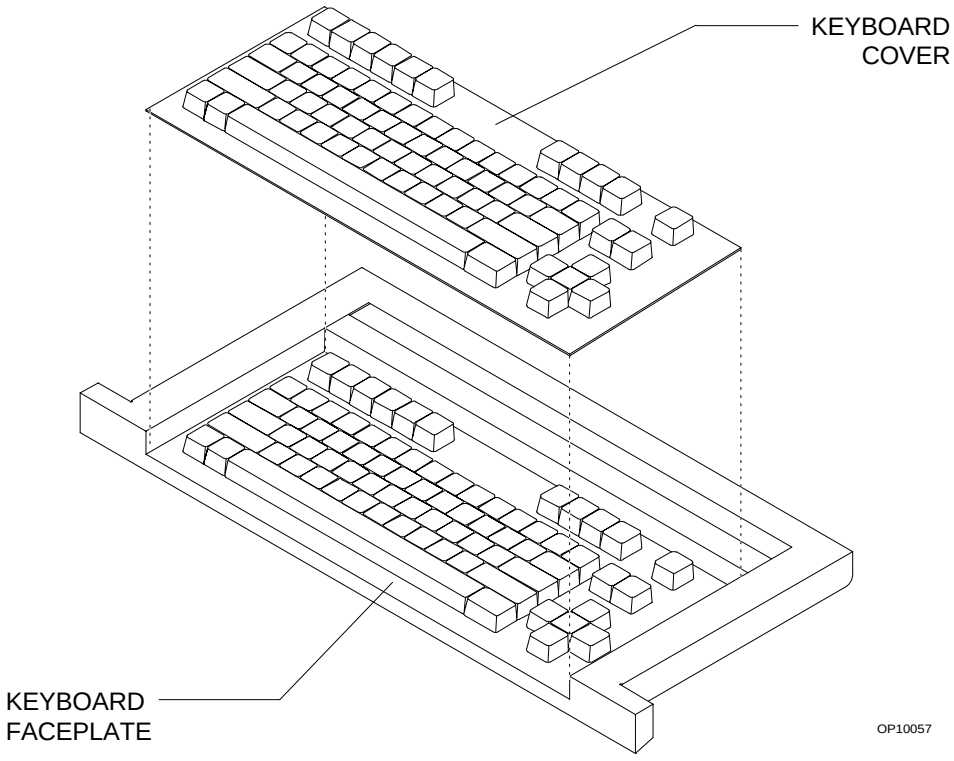
Section 6
Routine Maintenance and Cleaning

Replacing the Keyboard Cover

If the O.R. Data Manager keyboard cover becomes contaminated or damaged, it should be replaced.

To replace the keyboard cover:

1. Pull the keyboard tray out to its fully extended position.
2. Remove the contaminated or damaged keyboard cover from the keyboard faceplate by loosening the edges and pulling it away from the keyboard.
3. Clean any adhesive residue from the keyboard faceplate.
4. Remove the protective tape backing from the new shield to expose the adhesive surface.
5. Fit the new cover over the keys and press its adhesive perimeter firmly onto the keyboard faceplate. Verify that there are no gaps between the cover and the faceplate.



Replacing the Water Trap Reservoir

The disposable water trap reservoir is held in a bracket next to the patient interface panel on the left side of the monitor box. Its purpose is to collect moisture from the patient sample line and it must be replaced when it becomes full.

1. Detach the reservoir's flexible hose fitting at the sample line connection by twisting the Luer-lock connector counter-clockwise.

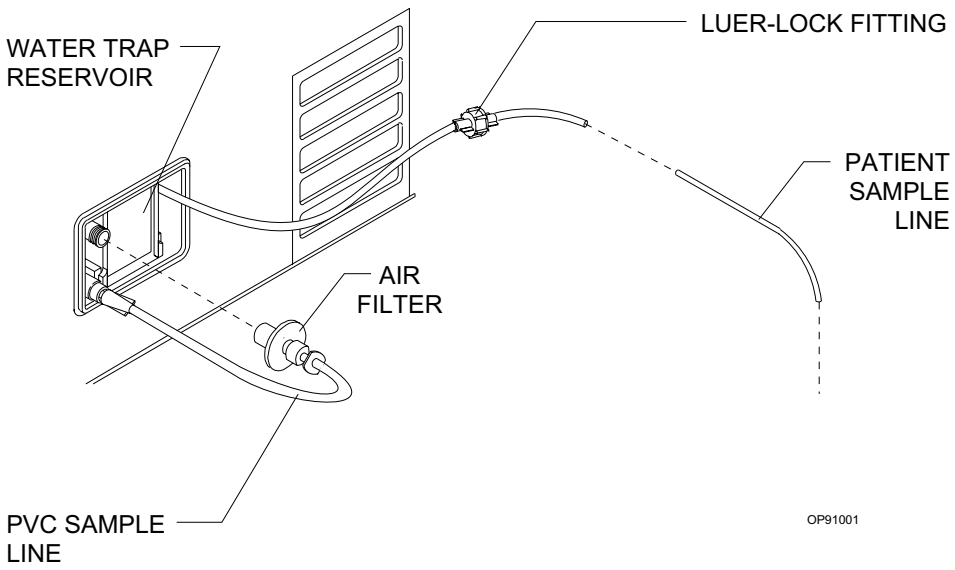
2. To gain access to the reservoir, temporarily remove the air filter by turning it counter-clockwise and pulling it from its mounting.

3. Grasp the reservoir at the base and gently pull it away from the mounting bracket, allowing the rubber port seals on top of the reservoir to disengage from the ports on the holder. Dispose of the full reservoir properly.

4. Insert the new reservoir by guiding its rubber port seals into the ports on the holder, and gently push at the base of the reservoir until it rests flat against its holder.

5. Connect the new reservoir's flexible line fitting to the male Luer-lock fitting on the sample line. Twist clockwise until secure.

6. Reattach the air filter to the fitting alongside the reservoir. Turn the filter clockwise until secure.



Section 6
Routine Maintenance and Cleaning

Replacing the Air Filter

The purpose of the air filter is to collect particulate contamination, and it should be replaced if it becomes clogged. Refer to the previous illustration for the location and mounting arrangement of the air filter.

1. Remove the air filter by turning it counterclockwise until it separates from the fitting on the machine.

2. Disconnect the PVC sample line from the filter by holding the filter and turning the Luer-lock fitting on the PVC sample line counterclockwise.

3. Install the replacement air filter on the fitting. Turn the filter clockwise until secure.

4. Reconnect the PVC sample line to the filter. Twist the Luer-lock fitting on the PVC sample line clockwise until secure.

Clearing Condensation in the Ultrasonic Flow Sensor

Depending on the conditions of use and the environment, condensation can accumulate in the flow sensor housing. Moderate amounts of condensation should not affect operation. Excessive condensation can result in erratic measurements or total loss of flow measurement.

To remove condensation:

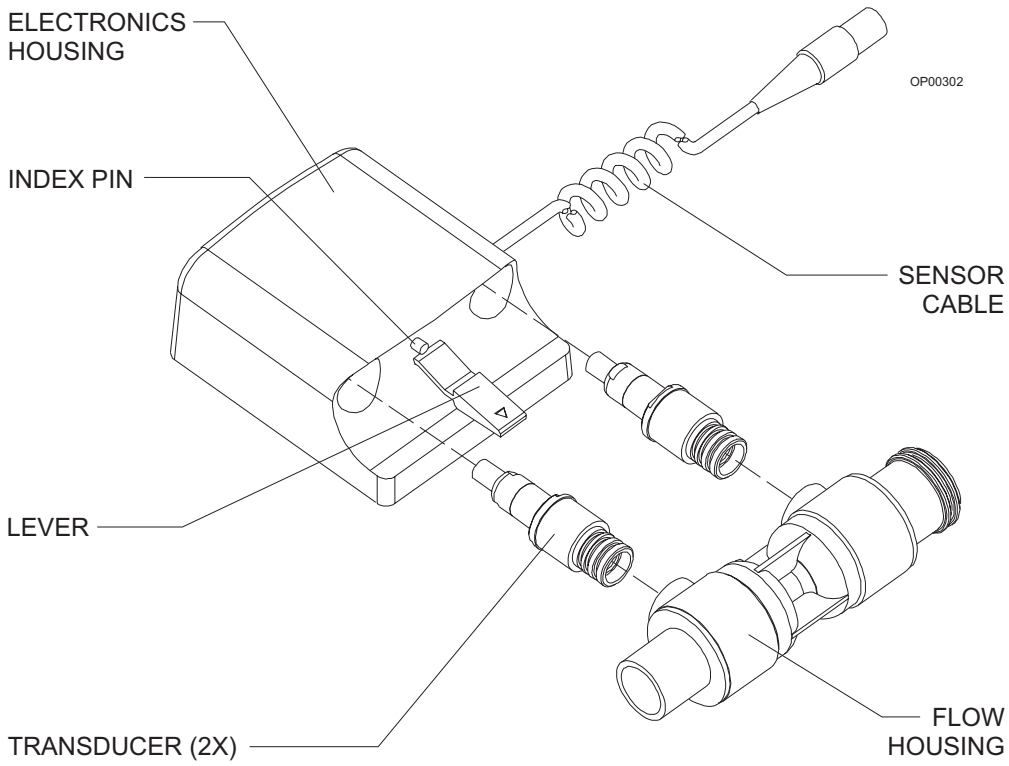
1. Remove the connector hose assembly between the flow sensor and expiratory valve by turning the ring nut counterclockwise.

2. Remove the patient hose from the expiratory hose terminal on the flow sensor.

3. Lift the flow sensor off the bracket.

4. Press down on the lever under the flow housing and remove the flow housing/transducer assembly from the electronics housing.

5. Pull both transducers out of the flow housing.



6. Tip and shake the flow housing to release fluid trapped in the housing.

7. Make sure that all large droplets are cleared from the transducer ports.

8. Pat the transducers dry with a soft, lint-free cloth.

9. Press the transducers back into their ports in the flow housing.

10. Slide the electronics housing over the flow housing/transducer assembly. Be sure that it clicks into place.

    NOTE: If the flow housing/transducer assembly does not fit easily into the electronics housing, make sure the flow housing is facing the right direction. Compare the direction to the illustration on the electronics housing. The index pin on the electronics housing should align with the hole in the flow housing.

11. Slide the flow sensor onto the bracket.

12. Connect the patient hose to the expiratory hose terminal on the flow sensor.

13. Install the connector hose assembly between the flow sensor and the expiratory valve, and secure it by turning the ring nut clockwise.

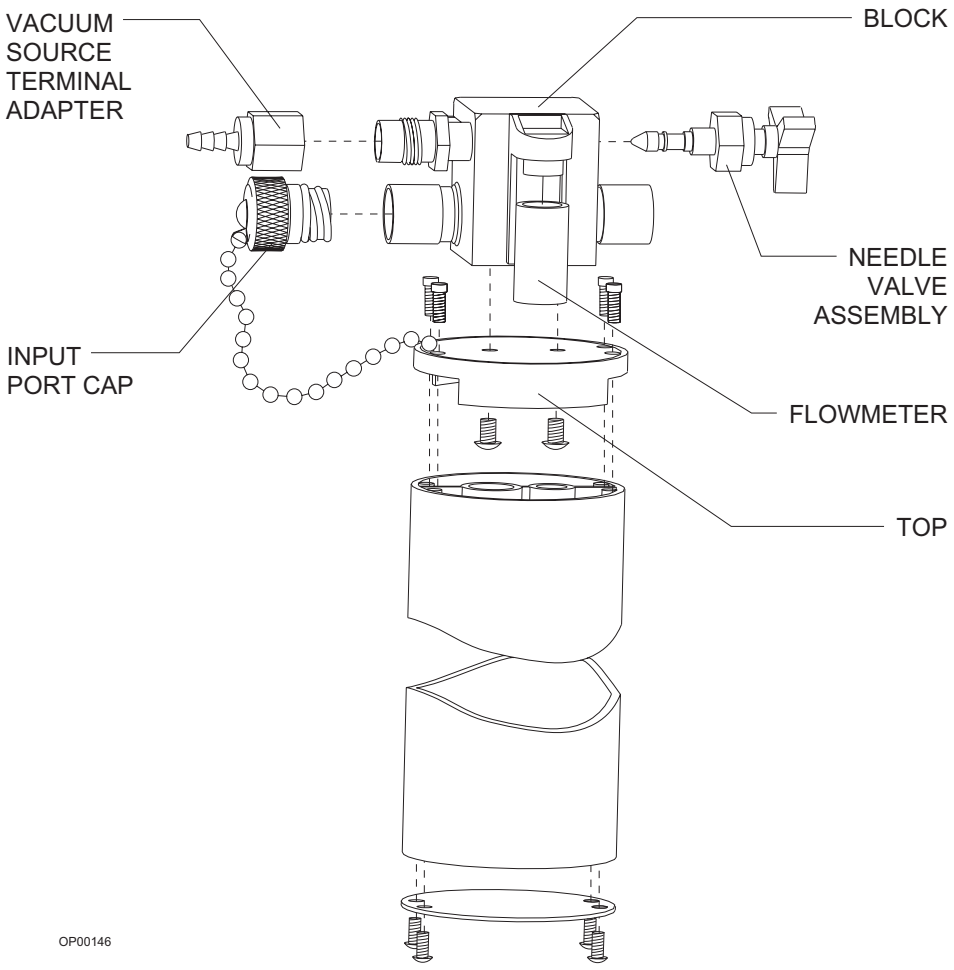
Open Reservoir Scavenger Maintenance

The scavenger should be cleaned at least once every six months.

1. Clean the outer surface of the scavenger with a soft cloth moistened with mild detergent and water.

2. Remove and inspect all scavenger hoses for signs of deterioration. Replace any worn hoses.

3. If applicable, unscrew the wing nut until the needle valve assembly can be removed from its seat. Remove the nut and disassemble the valve. Inspect the needle valve and seat for lint or dust accumulation. Clean with compressed air, if necessary.



4. The flowmeter has a small port, located on its underside, that is open to the atmosphere. For the flowmeter to work properly, this port must remain open. Remove the flowmeter from the block and inspect this port. If it is blocked, clean it with compressed air.

5. Remove the reservoir canister from the scavenger body by unscrewing the four socket head cap screws located at the top of the canister.

6. Replace the cleaned needle valve assembly and reservoir canister. Verify that all parts are completely dry before reassembly.

7. Perform the open reservoir scavenger portion of the daily checkout procedure provided in "Daily Checkout."

Scavenger Interface for Passive Systems Maintenance

The scavenger should be cleaned at least once every six months.

1. Clean the scavenger body with a moist cloth.

2. Inspect all scavenger hoses for deterioration. Replace any worn hoses.

3. Remove the relief valve housing by unscrewing it counterclockwise.

4. Inspect the rubber o-ring. If it is worn, replace it.

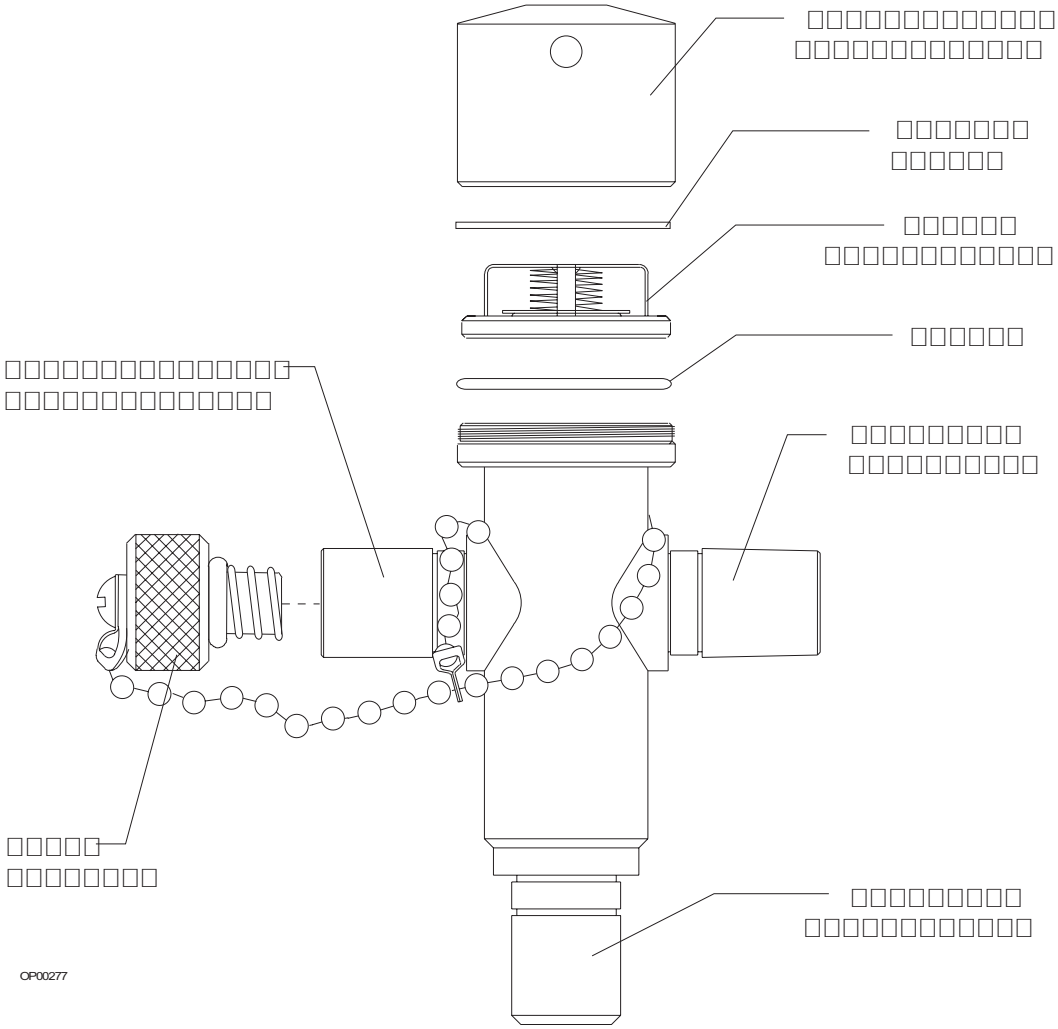
5. Remove the relief valve by twisting it counterclockwise out of the housing. You can use the tips of a needle-nose pliers to turn the valve, but take care not to damage the relief valve's fragile valve disk.

6. Brush any accumulated lint or dust off the valve with a soft brush. The valve can be further cleaned with a low flow of clean air or oxygen.

7. Reinstall the valve into the housing, making sure that it is threaded all the way into the housing and that the plastic washer is properly seated on its upper surface.

8. Verify that the interior of the valve body is completely dry. Reinstall the valve housing onto the scavenger body, making sure that the o-ring is properly seated.

9. Perform the scavenger interface for passive systems portion of the daily checkout procedure provided in "Daily Checkout."



Noninvasive Blood Pressure Cuff Maintenance

Before cleaning or sterilizing the NIBP cuff, detach it from the extension hose by twisting the Luer-lock fitting at the juncture of the cuff hose and measurement hose. Clean the cuff with a liquid disinfection agent or mild detergent solution.

Do not autoclave the cuff. It can be sterilized with ethylene oxide gas, followed by at least 2 hours aeration in an appropriate aeration cabinet.

Do not autoclave the extension hose. It can be sterilized with ethylene oxide gas (cold cycle), followed by at least 8 hours aeration in an appropriate aeration cabinet.

Section 6
Routine Maintenance and Cleaning

Manual Sphygmomanometer Maintenance

Under typical conditions, the only cleaning the manual sphygmomanometer requires is a wiping down with a liquid disinfection agent. However, if further disinfection is required, remove the sphygmomanometer gauge assembly, hoses, and blood pressure cuff from the anesthesia machine and sterilize them with ethylene oxide gas (cold cycle), followed by appropriate aeration according to the sterilizer manufacturer's instructions.

NOTE: Do not autoclave the gauge assembly; it cannot withstand the heat of autoclaving.

Removing Parts for Cleaning and Disinfection

1. Turn the SYSTEM POWER switch to STANDBY.
2. Disconnect the 22 mm breathing circuit hoses between the ventilator and the absorber and from the inspiratory valve and the expiratory hose terminal on the ultrasonic flow sensor. Remove the Y-piece, mask, and mask elbow from the hoses.
3. Disconnect the 19 mm scavenger hoses connecting the APL valve to the absorber pole and the ventilator relief valve to the scavenger.

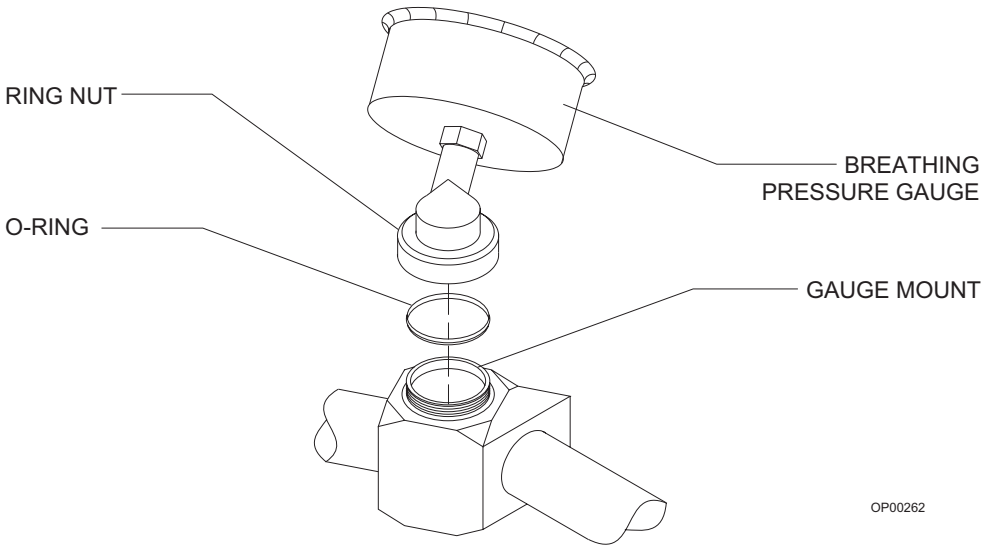
   NOTE: The scavenger interface generally does not need disinfection. However, if your facility requires a disinfection process for the scavenger interface and hoses, remove the scavenger and all 19 mm hoses. Refer back to the cleaning instructions under "Open Reservoir Scavenger Maintenance" or "Scavenger Interface for Passive Systems Maintenance" for disassembly instructions.
4. Remove the oxygen sensor assembly from the inspiratory valve, and disconnect the sensor cord from the system interface panel.
5. Disconnect the flow sensor cable from the system interface panel.
6. Remove the connector hose assembly between the flow sensor and the expiratory valve by turning the ring nut counterclockwise.
7. Lift the flow sensor off the bracket.
8. Disconnect the fresh gas hose from the fresh gas outlet.
9. Disconnect the breathing pressure pilot line from the absorber and the system interface panel.

10. Remove the absorbent canisters and dust cup. Discard the absorbent. Refer back to “Replacing the Absorbent” for instructions.

WARNING: Absorbent is caustic and a strong irritant to the eyes, skin, and respiratory tract. When removing the absorbent, take care not to spill its caustic contents.

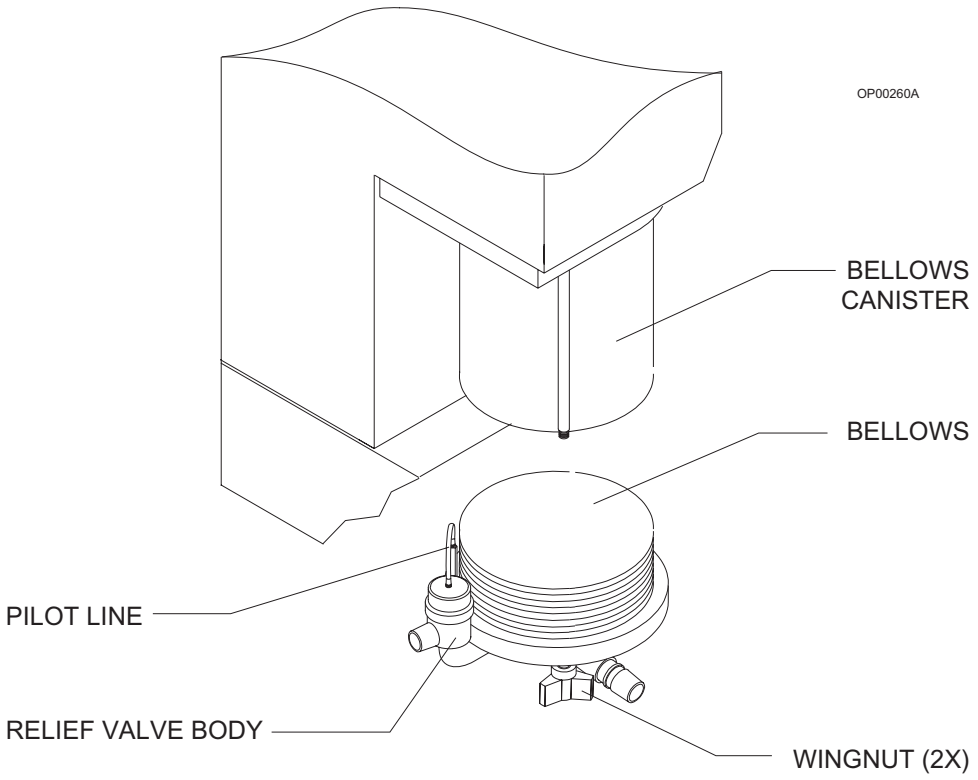
11. Remove the inspiratory and expiratory valves by turning their ring nuts counterclockwise until the valves are free of the system.

12. Remove the pressure gauge by turning the knurled ring nut that connects the pressure gauge to the gauge mount counterclockwise. Lift the pressure gauge assembly off the gauge mount. Do not misplace the o-ring.



13. Remove the absorber using a 3/16-inch hex screwdriver to loosen the hex screw securing the absorber assembly to the absorber pole. Do not remove the screw. Lift the absorber off the absorber pole. Do not misplace the o-ring.

14. Remove the bellows assembly by loosening the two wing nuts on the bottom of the assembly until the assembly releases from the canister.



Disassembling Parts for Cleaning and Disinfection

The following parts must be further disassembled for thorough cleaning and disinfection:

- oxygen sensor assembly
- respiratory sensor flow housing/transducer assembly
- ventilator bellows assembly
- inspiratory/expiratory valves

Disassembling the Oxygen Sensor Assembly

Unscrew the cover from the sensor housing and remove the sensor capsule. Take care not to drop the sensor housed inside. The sensor is not connected to the housing.

Disassembling the Flow Housing/ Transducer Assembly

1. Press down on the lever under the flow housing and pull the flow housing/transducer assembly out of the electronics housing.
2. Pull both transducers out of the flow housing.

Disassembling the Ventilator Bellows Assembly

Remove the bellows from the ventilator bottom assembly by unscrewing it in a counterclockwise direction until it is released.

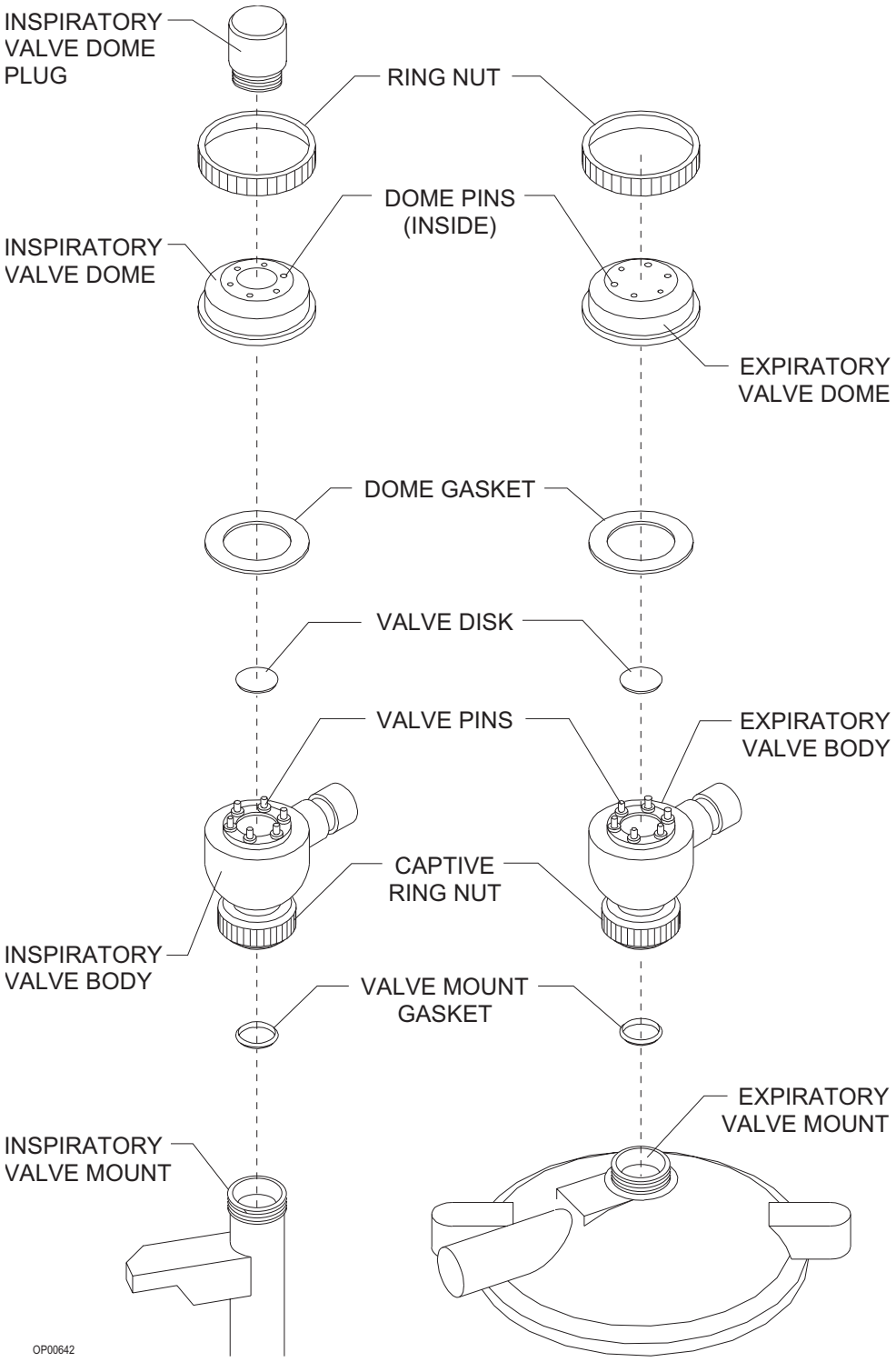
Unscrew the knurled ring nut around the ventilator relief valve and pull the relief valve dome and pilot line away from the relief valve body.

CAUTION: Take special care not to change the position of the adjustment lock ring on the ventilator relief valve dome. Do not attempt to loosen the knurled relief valve ring nut by twisting the pilot line hose barb.

Disassembling the Inspiratory and Expiratory Valves

1. Unscrew and remove the ring nut around the plastic valve dome.
2. Separate the plastic dome, dome gasket, and valve disk from the valve body.

Section 6
Routine Maintenance and Cleaning



General Guidelines for Cleaning and Disinfection

The frequency, level, and need for disinfection of the Narkomed 4 is determined by the user facility based on the conditions of use and hospital infection control policy. North American Dräger recommends using disposable patient breathing circuits that can be replaced after single use.

If disinfection is required, first clean, dry, and then disinfect the Narkomed 4 and its parts according to the guidelines provided in this chapter. Determining the need and frequency of cleaning or disinfecting any particular component is the responsibility of the user institution. These procedures should be performed according to procedures established by the user institution, following the specific instructions provided by the manufacturer of the equipment or agent used.

For additional information about infection control practice, refer to the *APIC Guideline for Selection and Use of Disinfectants*. This guideline was developed by the Association for Professionals in Infection Control and Epidemiology, Inc. and published in *AJIC* Vol. 24, No. 4 pp. 313-342, August 1996. The following table of recommended disinfection methods for the Narkomed 4 was adapted from the *APIC Guideline for Selection and Use of Disinfectants*.

Section 6
Routine Maintenance and Cleaning

Part	A	B	C	D	E	F
Exterior Painted, Plated, and Plastic Surfaces					x	x
Corrugated Breathing Hoses, Mask Elbow, and Breathing Bag	x	x	x	x		
Y-Piece and Mask		x	x	x		
Ventilator Bellows		x	x	x		
Ventilator Bellows Bottom Assembly		x				
Oxygen Sensor Capsule		x				
Oxygen Sensor Housing					x	x
Oxygen Sensor Housing Cover		x	x	x		
Inspiratory/Expiratory Valves	x	x	x	x		
Ultrasonic Flow Sensor Housing and Transducers	x					
Ultrasonic Flow Sensor Electronics Housing and Cable					x	x
Breathing Pressure Pilot Line		x				
Breathing System Pressure Gauge		x				
Absorber Canisters, Gaskets, and Dust Cup	x	x	x	x		
Vaporizer Exterior					x	x
Corrugated Scavenger Hoses (do not normally need disinfection)	x	x	x	x		
Open Reservoir Scavenger (does not normally need disinfection)		x			x	x
Passive Scavenger Interface (does not normally need disinfection)		x			x	x

A Heat sterilization (autoclaving), including steam or hot air (use manufacturer's recommendations)
B Ethylene oxide gas (use manufacturer's recommendations)
C Glutaraldehyde-based formulations (2%)
D Wet pasteurization at 70° C for 30 minutes after detergent cleaning
E Sodium hypochlorite (5.2% household bleach) 1:500 dilution (100 ppm free chlorine)
F Ethyl or isopropyl alcohol (70% to 90%)

CAUTION: To avoid damaging the Narkomed 4:

- Do not use Betadine®, Povodine®, Sagrotan®, Mucocit®, acetone, ketone, xylene, or anesthetic agents for cleaning.
- Dilute cleaning agents before use by strictly following the manufacturer's instructions.
- Do not use abrasives such as steel wool, liquid abrasives, or powder abrasives on the machine.
- Do not let any liquid enter the interior of the machine.
- Do not submerge any part of the system, unless specifically instructed to do so in this manual.
- Do not pour or spray liquid directly on the machine during cleaning. Always moisten a soft-lint free cloth with the appropriate cleanser before applying it to the machine.
- Wipe any spills and cleanser off the equipment surfaces immediately.

Cleaning and Disinfecting Exterior Surfaces

Clean painted, plated, and plastic surfaces with a soft lint-free cloth moistened with mild detergent and water. Follow up with a 70% to 90% diluted solution of ethyl or isopropyl alcohol or sodium hypochlorite (5.2% household bleach) at 1:500 dilution (100 ppm chlorine).

NOTE: North American Dräger makes no claims about the efficacy of these agents or this method of cleaning for infection control. Consult your hospital's infection control officer or epidemiologist.

Cleaning and Disinfecting Corrugated Breathing Hoses, Mask Elbow, and Bag

Contact with oxygen, ether, mineral or vegetable oils, phenols, cresois, terpenes, hydrocarbon solvents, chlorinated hydrocarbons, esters, or oxidizing acids hastens the deterioration process for rubber goods.

Check the hoses, mask elbow, and breathing bag often for signs of deterioration, including swelling, tackiness, or cracking. Replace the affected parts when any of these conditions are evident.

Thoroughly clean rubber goods with mild alkali detergent and water before disinfecting them. Then, thoroughly rinse them with water to remove all detergent. To prevent water spots, use distilled or demineralized water. Avoid using hard-bristle brushes.

Manufacturers of rubber goods recommend that reusable rubber goods be soaked in a liquid disinfection agent. Always follow the agent manufacturer's instructions for use.

CAUTION: Disinfectants containing phenol or phenyl compounds destroy rubber goods. Latex and rubber goods treated with disinfectants having a quaternary ammonium base will be damaged if subsequently autoclaved.

Use 2% glutaraldehyde-based formulations for more than 20 minutes or wet pasteurization at 70° C for 30 minutes after detergent cleaning.

Thoroughly rinse the corrugated hoses, mask elbow, and breathing bag after contact with chemicals. Use sterilized water to prevent contamination by tap water organisms. Thoroughly dry rubber goods before returning them to service.

The corrugated hoses, mask elbow, and breathing bag can be autoclaved at 121° C. However, such temperatures accelerate the natural aging of rubber goods. Autoclaved rubber goods can also harden over time as a result of the loss of softeners. Exposure to ozone or ultraviolet light also accelerates the natural aging of rubber goods. Reusable rubber goods can also be gas sterilized with ethylene oxide. After EtO sterilization, properly aerate rubber goods before returning them to service. Always follow manufacturer's instructions for these procedures.

CAUTION: Do not autoclave face masks. Autoclaving causes rapid deterioration of face mask cushions.

Cleaning and Disinfecting the Y-Piece and Mask

The Y-piece and mask can be disinfected by wiping or immersion with glutaraldehyde-based formulations. EtO and wet pasteurization processes can also be used.

Cleaning and Disinfecting the Ventilator Bellows

The ventilator bellows and its bottom assembly are the only ventilator components that come in contact with the patient's breath. Refer back to "Cleaning and Disinfecting Exterior Surfaces" for instructions on cleaning and disinfecting the surface of the ventilator bellows assembly.

Clean the bellows with a soft lint-free cloth moistened with mild alkali detergent and water, followed by a distilled water rinse. Let the bellows drip dry.

After cleaning, use wet pasteurization at 70°C for 30 minutes, a gluteraldehyde-based solution, or an EtO process to disinfect the ventilator bellows. Follow manufacturer's guidelines for these procedures.

Cleaning and Disinfecting the Ventilator Bellows Bottom Assembly

Clean the ventilator bellows bottom assembly with a soft lint-free cloth moistened with mild detergent and water, followed by a distilled water rinse. Allow the assembly to drip dry.

After cleaning, use an EtO process for disinfection. Follow manufacturer's guidelines.

Cleaning and Disinfecting the Oxygen Sensor Capsule

Wipe the oxygen sensor capsule with a soft lint-free cloth moistened with mild detergent and water. Make sure the capsule is dry before replacing it.

CAUTION: Do not immerse or autoclave the oxygen sensor capsule.

After cleaning the capsule, perform an EtO process at a temperature not exceeding 50°C. Aerate the sensor according to the manufacturer's instructions.

Cleaning and Disinfecting the Oxygen Sensor Housing

The oxygen sensor housing can be immersed for cleaning and disinfection. Use mild detergent and water for cleaning. For disinfection, follow up with either sodium hypochlorite (5.2% household bleach) l:500 dilution (100 ppm free chlorine) or 70% to 90% ethyl or isopropyl alcohol.

Cleaning and Disinfecting the Oxygen Sensor Housing Cover

The oxygen sensor housing cover can be immersed or wiped during cleaning and disinfection. Use mild detergent and water for cleaning. For disinfection, follow up with a 2% glutaraldehyde-based formulation, wet pasteurization at 70°C for 30 minutes, or an EtO process.

Cleaning and Disinfecting the Inspiratory and Expiratory Valves

The inspiratory and expiratory valves come into contact with the patient's breath. Clean these parts with soft lint-free cloth moistened with mild alkali detergent and water. Dry the parts before reassembling.

The valve assemblies can be immersed in a 2% glutaraldehyde-based solution, wet pasteurized, gas sterilized, or autoclaved at a temperature not exceeding 121° C. The valve disks can also be autoclaved in certain instances, but should not be autoclaved routinely.

Be careful while handling the valve disks. Improper handling can damage them. After cleaning or disinfecting the inspiratory or expiratory valve assembly, verify that the valve disk and all internal pins are undamaged and that the valve disks are correctly reinstalled.

Section 6
Routine Maintenance and Cleaning

Cleaning and Disinfecting the Ultrasonic Flow Sensor Housing and Transducers

Wash the flow housing and transducers with mild detergent and water. Follow with a distilled water rinse. These components can be immersed.

The flow housing and transducers can be autoclaved at a temperature not exceeding 121°C. Follow the manufacturer's instructions for the process. Allow the transducers to normalize for 30 minutes under room ambient conditions before using them.

Cleaning and Disinfecting the Ultrasonic Flow Sensor Electronics Housing and Cable

Wipe the electronics housing and sensor cable with a clean, soft cloth moistened with mild detergent and water. Take care not to allow any fluid to access the interior of the electronics housing.

The electronics housing and sensor cable can be wiped with a clean, soft, lint-free cloth moistened with a 70% to 90% diluted solution of ethyl or isopropyl alcohol or sodium hypochlorite (5.2% household bleach) at 1:500 dilution (100 ppm chlorine).

NOTE: North American Dräger makes no claims about the efficacy of these agents or this method of cleaning for infection control. Consult your hospital's infection control officer or epidemiologist.

Cleaning and Disinfecting the Breathing System Pressure Gauge

Wipe the pressure gauge assembly with a soft lint-free cloth moistened with mild detergent and water. Dry the assembly before reinstalling.

The gauge can be disinfected with ethylene oxide gas, followed by appropriate aeration. Follow the manufacturer's instructions.

CAUTION: The breathing system pressure gauge cannot withstand immersion or the heat and pressure of autoclaving.

Cleaning and Disinfecting the Absorber Canister Assemblies and Dust Cup

Refer to the instructions provided earlier in this chapter under the heading, "Replacing the Absorbent" for instructions on removing the absorbent canister assemblies from the absorber.

Clean the canisters frequently. Remove used absorbent and clean absorbent residues for the canister and gasket surfaces. Check the dust cup periodically. Empty and clean it when necessary.

WARNING: Absorbent is caustic. Avoid contact with the skin and eyes.

After removing the canister assemblies and dust cup from the absorber system, wash these parts with mild alkali detergent and water. The canister assemblies and dust cup can be immersed or wiped with a soft lint-free cloth. Allow the parts to dry.

Several methods can be used for disinfection. Wet pasteurization, autoclaving, EtO, and immersion or wiping with 2% glutaraldehyde-based solution are all acceptable. If an EtO process is used, make sure the parts are properly aerated before returning them to service.

Cleaning and Disinfecting the Absorber Assembly

Turn the APL valve control knob fully counterclockwise before cleaning or disinfecting the absorber system.

After cleaning, an EtO procedure can be used. Follow manufacturer's guidelines.

CAUTION: Do not autoclave the absorber assembly.

Cleaning and Disinfecting the Vaporizer Exterior

Clean the vaporizer with a soft lint-free cloth moistened with mild detergent and water. Follow up with a 70% to 90% diluted solution of ethyl or isopropyl alcohol or sodium hypochlorite (5.2% household bleach) at 1:500 dilution (100 ppm chlorine). Do not sterilize the vaporizer.

WARNING: Water and other liquids (with the exception of the appropriate anesthetic) that enter the vaporizer chamber can cause injury to the patient or form corrosive products that affect the function of the vaporizer.

CAUTION: Do not immerse the vaporizer or allow water or any other liquid to enter the fill or drain ports or fresh gas inlet or outlet ports. Any vaporizer suspected of contamination with water or any other liquid must be returned to North American Dräger's Technical Service Department for a complete overhaul.

Additional care must be taken with halothane vaporizers. Halothane contains a stabilization additive called thymol, which evaporates more slowly than halothane, and collects in the vaporizer. Over time, thymol may decompose into compounds that affect the wick material and turn the halothane yellow.

If you see particles in the sight glass of a halothane vaporizer, or if the halothane turns yellow, rinse the vaporizer chamber with fresh halothane as follows:

1. Drain the discolored halothane from the vaporizer.

2. Fill the vaporizer with fresh halothane up to the maximum level, then drain completely.

3. Dispose of the drained halothane in accordance with standard practices at your facility.

Section 6
Routine Maintenance and Cleaning

For information about filling and draining the vaporizer, see Section 5, “Operation - Vaporizer.”

Cleaning and Disinfecting the Open Reservoir Scavenger

The scavenger interface does not normally need to be disinfected. However, if the user facility requires disinfection, an EtO process can be used after cleaning. Refer back to the cleaning instructions provided under the “Routine Maintenance“ section in this chapter.

CAUTION: Do not autoclave the open reservoir scavenger. The scavenger’s flowmeter cannot withstand the heat of autoclaving.

Cleaning and Disinfecting the Passive Scavenger Interface

The scavenger interface does not normally need to be disinfected. However, if the user facility requires disinfection, an EtO process can be used after cleaning. Refer back to the cleaning instructions provided under the “Routine Maintenance“ section in this chapter.

CAUTION: Do not autoclave the scavenger interface for passive systems. The scavenger’s relief valves cannot withstand the heat of autoclaving.

Disinfecting the Scavenger Hoses

The scavenger hoses are not part of the breathing circuit, so they do not require disinfection. If the user facility requires disinfection, refer back to the instructions provided in “Cleaning and Disinfecting Corrugated Breathing Hoses, Mask Elbow, Mask and Bag” to select a compatible process.

Check the hoses frequently for signs of deterioration, including swelling tackiness, or cracking. Replace the affected parts when any of these conditions are evident.

Reassembly Instructions

Make sure all parts are complete dry and adequately aerated before reassembling the machine after cleaning and disinfection procedures.

1. Reassemble the ventilator bellows assembly. Fit the relief valve dome onto the relief valve body, and tighten the knurled ring nut. Place the ventilator bellows on bellows bottom assembly and turn it clockwise until it is secure.

2. Replace the bellows assembly. Fit the bellows assembly into the ventilator bellows canister and tighten the two wing nuts.

3. Replace the absorber. Fit the absorber assembly on the absorber pole, making sure the o-ring is in place. Use a 3/16-inch hex screwdriver to tighten the hex screw securing the absorber system assembly to the absorber pole.

4. Replace the pressure gauge. Place the pressure gauge assembly on the gauge mount, making sure that the o-ring is in place between the pressure gauge assembly and the gauge mount. Slide the knurled ring nut over the threads on the gauge mount. Turn the knurled ring nut clockwise until it is secure. Check the gauge needle's zero position and adjust it if necessary.

5. Replace the canisters and dust cup, making sure the gaskets and o-ring are in place. Pull the canister lever up until it clicks in place.

6. Reassemble the inspiratory and expiratory valves. Place the valve disk and dome gasket in the valve body, then replace the dome and ring nut. Turn the ring nut clockwise to tighten.

7. Replace the inspiratory valve assembly and gasket on the valve mount. Turn the valve assembly clockwise to secure it to the valve mount.

8. Replace the expiratory valve assembly and gasket on the absorber. Turn the valve assembly clockwise to secure it to the absorber dome.

9. Reassemble the ultrasonic flow sensor. Press the transducers into their ports on the flow housing. Ensure that the three o-rings on each transducer are not damaged and are properly seated. Slide the flow housing/transducer assembly into the electronics housing. Be sure that it clicks into place.

   NOTE: If the flow housing/transducer assembly does not fit easily into the electronics housing, make sure the flow housing is facing the right direction. Compare the direction to the illustration on the electronics housing. The index pin on the electronics housing should align with the hole in the flow housing.

10. Slide the flow sensor onto the bracket.

11. Connect the patient hose to the expiratory hose terminal on the flow sensor.

12. Install the connector hose assembly between the flow sensor and the expiratory valve, and secure it by turning the ring nut clockwise.

13. Connect the sensor cable to the volume sensor receptacle on the system interface panel.

14. Replace the oxygen sensor in the inspiratory valve port. Connect the sensor cord to the system interface panel.

15. Connect the fresh gas hose to the fresh gas outlet on the machine.

    WARNING: Do not pinch or kink the fresh gas hose leading form the fresh gas outlet to the absorber.

16. Reconnect the breathing pressure pilot line to the absorber and the system interface panel.

17. Replace the 22 mm hoses and other breathing circuit accessories.

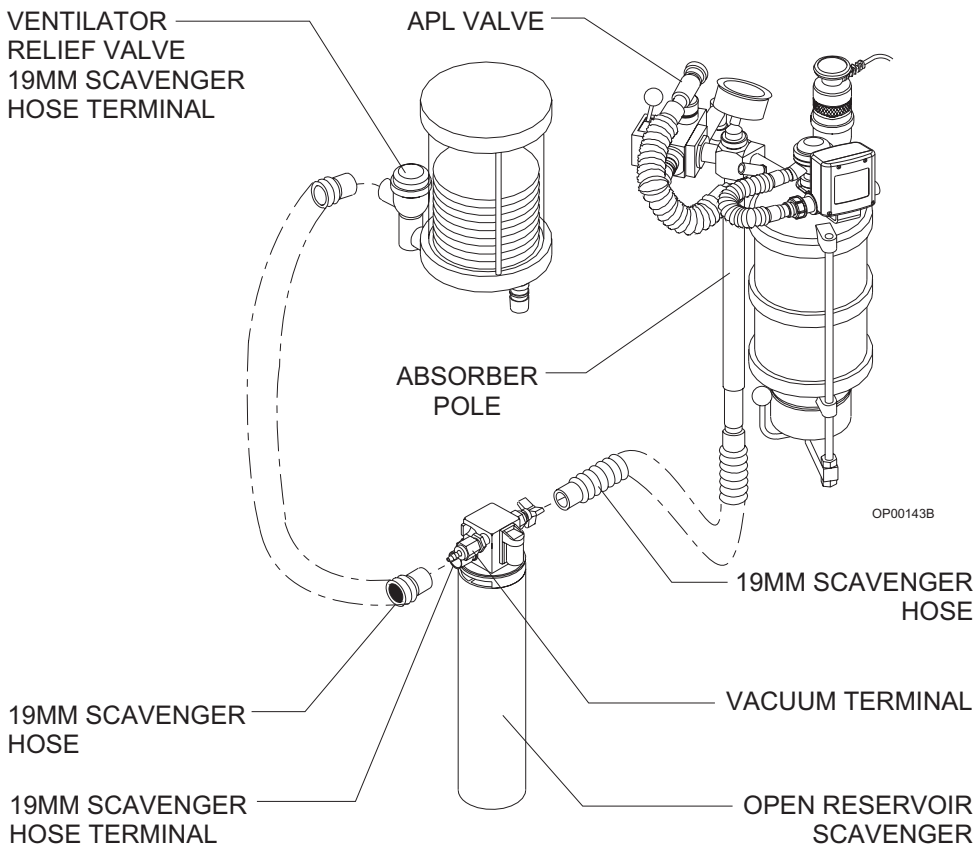
18. Replace the 19 mm hose that connects the APL valve to the absorber pole.

19. Replace the 19 mm hoses that connect ventilator relief valve and absorber pole to the scavenger as illustrated in the following drawings. If the scavenger hoses were removed from the scavenger, replace the scavenger hoses as illustrated on the following pages.

20. Turn the SYSTEM POWER switch to ON.

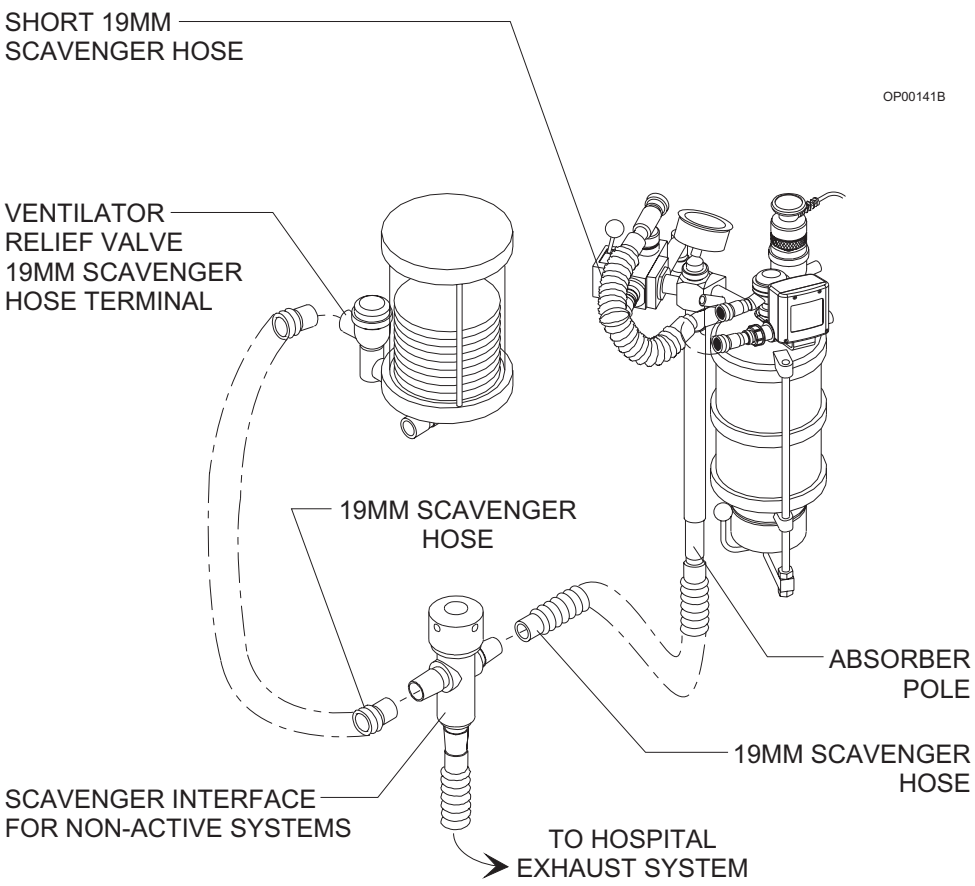
21. Perform the daily checkout procedure provided in this manual before operating the machine.

Open Reservoir Scavenger Connections



Section 6
Routine Maintenance and Cleaning

Passive System Scavenger Connections



Section 7
Specifications

General

Maximum dimensions (W x H x D) . . . . . 40 x 63 3/4 x 30 1/4 inches
Weight (approximate) . . . . . 500 lb

Environmental

Storage

Temperature . . . . . -10–50° C
Humidity . . . . . 10–70% relative humidity (noncondensing)

Operating

Temperature . . . . . 10–30° C
Humidity . . . . . 30–70% relative humidity (noncondensing)

Electrical

Equipment class . . . . . IEC 601 Class 1, Type B
Leakage current . . . . . ≤ 100 microamps
Ground impedance . . . . . ≤ 0.1 ohm (60 Hz source)
Dielectric withstand . . . . . ≥ 1500 VAC (per UL 544)
Chassis resistance (between any metallic point and ground pin on power cord) . . . . . ≤ 0.1 ohm

117 Volt Power Supply

Primary input voltage (acceptable range) . . . . . 90–130 VAC @ 50/60 Hz
Primary input current . . . . . ≤ 8 amps (RMS total)
≤ 3 amps (machine)
≤ 5 amps (receptacles)
Primary input power (includes receptacles) . . . . . ≤ 920 watts

220/240 Volt Power Supply

Primary input voltage (acceptable range) . . . . . 180–265 VAC @ 50/60 Hz
Primary input current . . . . . ≤ 1.5 amp (RMS total)
Primary input power . . . . . ≤ 345 watts

Backup Battery

Charging time . . . . . ≤ 12 hours
Reserve power time (from full charge) . . . . . ≥ 25 min

Gas Delivery System

Pipeline inlet connections . . . . . DISS/male Nut with nipple (Canada)
Pipeline inlet pressure . . . . . 50–55 psi (345–380 kPa) (O_2,N_2O, Air)
Pipeline gauge accuracy . . . . . ±3 psi (0–25 psi)
±2 psi (25–75 psi)
±3 psi (75–100 psi)
Cylinder connections . . . . . Pin-indexed hanger yokes (CGA V-1-1994)
Over pressure relief valve . . . . . 95 psi (655 kPa)
Over pressure relief valve (Canada) . . . . . 75 psi (520 kPa) (CSA Standard Z168.3-M84)
Fresh gas common outlet . . . . . 15 mm female (Canada: 15 mm female, 22 mm male)
Fresh gas oxygen concentration (ORC) . . . . . 25 ±4%

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Oxygen flush flow rate . . . . . 55 (±10) l/min
Minimum oxygen flow (at 50 psi pipeline pressure) . . . . 150 ±50 ml/min
Low oxygen supply pressure alarm . . . . . 34–40 psi
Cylinder gauge accuracy . . . . . ±90 psi (0–750 psi)
±60 psi (750–2250 psi)
±90 psi (2250–3000 psi)

Cylinder Gas Pressures (typical full loads at 70°F, 21°C)

Oxygen, Air . . . . . 1900 psi (13100 kPa)
Nitrous oxide . . . . . 745 psi (5130 kPa)
Carbon dioxide . . . . . 838 psi (5770 kPa)

Flowmeter Accuracy (at 20°C and 760 mmHg)

Oxygen, Nitrous Oxide, Air
(Fine) . . . . . 100–1000 ml/min ±2.5% FS
Oxygen, Nitrous Oxide, Air
(Coarse) . . . . . 1–10 l/min ±2.5% FS
Air (Dual Tapered) . . . . . 0.2–1 l/min ± 50 ml of reading
2–10 l/min ±5% FS
Carbon Dioxide . . . . . 0.05–1.0 l/min ±5% FS
Oxygen, Nitrous Oxide (Fine)
(Optional, Low-Flow) . . . . . 20–500 ml/min ±2.5% FS
Oxygen, Nitrous Oxide (Coarse)
(Optional, Low-Flow) . . . . . 0.6–10 l/min ±2.5% FS @ >1 l/min
± 15% of reading @ <1 l/min
Oxygen (Auxiliary Oxygen) . . . . . 0–10 l/min ±5% FS

Vaporizers (Vapor 19.1)

Temperature Range . . . . . +15–35° C
(at normal atmospheric pressure of 760 mmHg)
Flow Range . . . . . 0.25–15 l/min
Maximum Pressure Load . . . . . 150 mmHg
(above atmospheric)
Maximum Angle of Inclination . . . . . 45°
Weight . . . . . Approximately 7.5 kg

The following values refer to individual concentration settings when operated with a continuous flow of air in the range 0.25–15 l/min, temperature at 22° C, and normal atmospheric pressure (760 mmHg).

Halothane

Adjustment range . . . . . 0.2–5 vol %
Accuracy . . . . . ±0.15% concentration (volume) **or** ±15% (whichever is higher)

Enflurane	Adjustment range . . . . . 0.3–7 vol % Accuracy . . . . . ±0.2% concentration (volume) **or** ±20% (whichever is higher) **or** +20%/-30% with flow settings 6.0–15 l/min and handwheel settings higher than 5.0% volume concentration
Isoflurane	Adjustment range . . . . . 0.2–5 vol % Accuracy . . . . . ±0.15% concentration (volume) **or** ±15% (whichever is higher)
Sevoflurane	Adjustment range . . . . . 0.3–8 vol % Accuracy . . . . . ±0.2% concentration (volume) **or** ±20% (whichever is higher)

Ventilator

	Frequency . . . . . 1–99, ±1 BPM (in 1 BPM increments) I:E ratio . . . . . *Standard range*: 1:1–1:4.5, ±0.1 (in increments of 0.5); *Extended range*: 4:1, 3:1, 2:1 Inspiratory flow . . . . . 10–100 l/min (uncalibrated) Tidal volume . . . . . 20–1500 ml, ±100 ml Pressure limit control adjustment range . . . . . 15–120 cmH_2O

Absorber System

Inspiratory Valve	Mounting ring nut size . . . . . M35 x 1 Hose terminal . . . . . 22 mm male
Expiratory Valve	Mounting ring nut size . . . . . M33 x 1 Hose terminal . . . . . 22 mm male
PEEP Valve (optional)	Range . . . . . approx. 2–15 cmH_2O (continuously adjustable)
Breathing System Pressure Gauge	Range . . . . . -20 to +80 cmH_2O Smallest scale division . . . . . 2 cmH_2O Nominal accuracy . . . . . -20 to +5 cmH_2O: 3% FS +5 to +55 cmH_2O: 2% FS +55 to +80 cmH_2O: 3% FS Mounting ring nut size . . . . . 1 1/8 x 18
APL Valve	Nominal low flow resistance . . . . . 2 cmH_2O at 8 l/min Hose terminal . . . . . 19 mm male
Breathing Bag Terminal	Bag terminal . . . . . 22 mm male

Section 7
Specifications

Pulse Oximetry Monitoring

Monitor

SpO_2 display range 0–100%
Accuracy . . . . . 70–100%, ±2% full scale
Pulse display range . . . . . 35–250 BPM

Noninvasive Blood Pressure Monitoring

Monitor

Systolic blood pressure display range . . . . . 60–260 mmHg (Adult)
40–260 mmHg (Neonatal)
Diastolic blood pressure display range . . . . . 25–260 mmHg (Adult)
15–260 mmHg (Neonatal)
Mean blood pressure display range . . . . . 35–260 mmHg (Adult)
25–260 mmHg (Neonatal)
Resolution . . . . . 1 mmHg
Pulse rate display range . . . . . 40–250 BPM
Resolution . . . . . 1 BPM

Cuff Inflation

Maximum cuff inflation pressure . . . . . 325 mmHg (Adult)
220 mmHg (Neonatal)
Maximum cuff inflated time . . . . . 2.5 minutes
Minimum cuff deflated interval between measurements . . . . . 3 sec
Sample duration (automatic mode) . . . . . 25–30 sec (Adult)
15–20 sec (Neonatal)
Sample duration (stat mode) . . . . . 12–30 sec (Adult)
15–20 sec (Neonatal)

Breathing Pressure Monitoring

Numeric display range . . . . . -10–125 cmH_2O
Resolution . . . . . 1 cmH_2O
Accuracy . . . . . ±3 cmH_2O or ±10% of reading, whichever is greater
Waveform display range - full . . . . . 0–125 cmH_2O
Waveform resolution . . . . . 1 cmH_2O
Waveform accuracy . . . . . ±3 cmH_2O or ±10% of reading, whichever is greater
Waveform display scales . . . . . 0–20, 0–50, 0–125 cmH_2O

Respiratory Volume Monitoring

Minute Volume

Display Range . . . . . 0.1–50.0 l
Resolution . . . . . 0.1 l
Accuracy . . 10% of reading or 0.01 l x breath rate,whichever is greater*

Tidal Volume

Display Range . . . . . 0.01–2.0 l
(Note: the standard bellows will deliver up to 1.5 l)
Resolution . . . . . 0.01 l
Accuracy . . . . . 10% of reading or 0.015 l, whichever is greater*
Volume Apnea Threshold . . . . . 0.02 l

Respiratory Rate

Numeric display range . . . . . 2–99 bpm
Resolution . . . . . 1 bpm
Accuracy . . . . . ±10% of reading or 1 bpm, whichever is greater

*exclusive of hose compliance effects

Respiratory Gas Analysis

CO_2 Measurement

Numeric Display Range . . . . . 0–80 mmHg
Numeric Display Resolution . . . . . 1 mmHg
Measuring Range . . . . . 0–76 mmHg
Accuracy (full accuracy mode) . . . . . ±2.0 mmHg (0-40)
±2.5 mmHg (41–60)
±4.0 mmHg (61-80)
Accuracy (reduced accuracy mode) . . . . . ±10.0 mmHg (0-20)
±15.0 mmHg (21-40)
±25.0 mmHg (41-60)
±35.0 mmHg (61-80)
Response . . . . . 180 mS (@ 200 ml/minute flow)
Noise (full accuracy mode) . . . . . 1.0 mmHg (0-20)
1.5 mmHg (21-40)
2.0 mmHg (41-60)
2.5 mmHg (61-80)

Section 7
Specifications

Oxygen Monitoring

Numeric display range	0–100 vol % O_2
Resolution	1 vol % O_2
Accuracy	±3 vol % O_2 (When calibrated within 18 hours, and constant temperature and pressure)
Response time	≤ 25 sec (T90)
Zero drift	≤ 0.1 vol % O_2/month
Span drift	≤ 1.0 vol % O_2/8 hours
Temperature error	±3% of reading (15° to 40° C)
Sensor service life	≥8 months at 25° C, 50% relative humidity, 50% O_2 gas mixture (or ≥5000% hour CO_2)

N_2O Measurement

Numeric Display Range	0–100 vol %
Numeric Display Resolution	0.1 vol %
Measuring Range	0–100 vol %
Accuracy (full accuracy mode)	±1.5% abs ±5.0% rel vol
Accuracy (warm up mode)	±5.0% abs ±33.0% rel vol
Noise (full accuracy mode)	±3.0 vol % abs
Noise (warm up mode)	±4.0 vol % abs
Response	320 mS (@ 200 ml/min flow)

Halothane

Numeric Display Range	0–10.0 vol %
Numeric Display Resolution	0.1 vol %
Measuring Range	0–7.5 vol %
Accuracy (full accuracy mode)	±0.2% abs ±4.0% rel vol
Accuracy (warm up mode)	±1.5% abs ±15.0% rel vol
Noise (full accuracy mode)	±0.2 vol % abs
Noise (warm up mode)	±0.3 vol % abs
Response	320 mS (@ 200 ml/min flow)

Enflurane

Numeric Display Range	0–10.0 vol %
Numeric Display Resolution	0.1 vol %
Measuring Range	0–7.5 vol %
Accuracy (full accuracy mode)	±0.1% abs ±4.0% rel vol
Accuracy (warm up mode)	±0.5% abs ±15% rel vol
Noise (full accuracy mode)	±0.1 vol % abs
Noise (warm up mode)	±0.2 vol % abs
Response	320 mS (@ 200 ml/min flow)

Isoflurane

Numeric Display Range . . . . . 0–10.0 vol %
Numeric Display Resolution . . . . . 0.1 vol %
Measuring Range . . . . . 0–7.5 vol %
Accuracy (full accuracy mode) . . . . . ±0.1% abs
±4.0% rel vol
Accuracy (warm up mode) . . . . . ±0.5% abs
±15% rel vol
Noise (full accuracy mode) . . . . . ±0.1 vol % abs
Noise (warm up mode) . . . . . ±0.2 vol % abs
Response . . . . . 320 mS (@ 200 ml/min flow)

Desflurane

Numeric Display Range . . . . . 0 to 24 vol %
Numeric Display Resolution . . . . . 0.1 vol %
Measuring Range . . . . . 0 to 20 vol %
Accuracy (full accuracy mode) . . . . . ±0.1 abs
±6.0% rel vol
Accuracy (warm up mode) . . . . . ±0.5 abs
±15% rel vol
Noise (full accuracy mode) . . . . . 0.1 vol % abs
Noise (warm up mode) . . . . . 0.2 vol % abs
Response . . . . . 320 mS (@ 200 ml/min flow)

Sevoflurane

Numeric Display Range . . . . . 0–11 vol %
Numeric Display Resolution . . . . . 0.1 vol %
Measuring Range . . . . . 0–9 vol %
Accuracy (0–5%, full accuracy mode) . . . . . ±0.1% abs
±4% rel vol
Accuracy (0–5%, warm up mode) . . . . . ±0.5% abs
±15% rel vol
Noise (full accuracy mode) . . . . . ±0.1 vol % abs
Noise (warm up mode) . . . . . ±0.2 vol % abs
Response . . . . . 320 mS (@ 200 ml/min flow)

Section 7
Specifications

Serial Interface

Serial Ports

Type . . . . . RS-232C (ports C and D)
RS-232C/RS-422 (ports A and B)
Baud Rate 300, 600, 1200, 2400
4800, 9600, 19.2K, or 38.4K
Parity . . . . . Odd, Even, None
Data Bits . . . . . 7 or 8
Stop Bits . . . . . 1 or 2
Protocols . . . . Vitalink, OR/Link, Hewlett-Packard MECIF, Datex AS/3,
SpaceLabs DataLogger, Criticare Poet IQ,
Marquette TramNet (ports A and B only)
(optional protocols: Datex CARDIOCAP and CAPNOMAC
Criticare 1100
Datascope Multinex, Passport, and Point-of-View
Siemens SIRECUST
Puritan-Bennett
Colin BP-508
Criticon DINAMAP
Nellcor N-1000/N-2500
Ohmeda Rascal
Ohmeda RGM)

Manual Sphygmomanometer

Type . . . . . Aneroid
Range . . . . . 0–300 mmHg
Accuracy . . . . . ± 3% FS (0–75 mmHg)
± 1% FS (75–225 mmHg)
± 3% FS (225–300 mmHg)

Appendix A
Spare and Replacement Parts

	Description	Part Number
Manuals	Narkomed 4 Operator's Instruction Manual	4111403
	Narkomed 4 Technical Service Manual	4112817-005
Absorber System	Gasket - Canister Top	4105848
	Gasket - Canister Bottom	4105849
	Gasket - Absorber Bottom	1101001
	Screen - Canister	1100022
	Canister	4105852
	Breathing Pressure Gauge Assembly	4105853
	PEEP Bypass	4110300
	Dome - Inspiratory/Expiratory Valve (without port)	2109230
	Dome - Inspiratory Valve (with sensor port)	4108329
	Plug Assembly - (for inspiratory valve dome with sensor port)	4106837
	Valve Assembly - Inspiratory (with ported dome assembly and plug assembly)	4107649
	Valve Assembly - Expiratory	4107650
	Ring Nut (inspiratory or expiratory valve upper ring nut)	2109228
	Gasket (flat washer, inspiratory or expiratory valve mount)	1101690
	Dust Cup	4106874
	Spring Clip (absorber rod)	1100097
	Hose Assembly (patient pressure/Luer)	4108528
	O-ring #020, Silicone (absorber mount)	4105868
	O-ring #237, Silicone (dust cup fitting)	4102940
Breathing System Accessories	Breathing Hose, 22 mm x 23" long	9995123
	Breathing Hose, 22 mm x 32" long	9995132
	Breathing Hose, 22 mm x 40" long	9995140
	Rubber Good Set (includes Y-Piece, Mask Elbow, 2 Liter Breathing Bag, and 2 each 32" Breathing Hoses)	1101071
Gas Evacuation Accessories	Hose, 19 mm x 10" long	9995210
	Hose, 19 mm x 20" long	9995220
	Hose, 19 mm x 30" long	9995230
	Hose, 19 mm x 48" long	9995248
Breathing Bags	2.0 liter	9995320
	5.0 liter	9995350
Vaporizers 19.1	Mounting screws (4 x 30 metric)	HW01072
	O-rings	2121929
	Cover assembly vapor block (short circuit block)	4104530
Bellows	Adult Latex-Free Bellows (replacement bellows)	4106930-001
	Pediatric Bellows	4109700

Appendix A
Spare and Replacement Parts

	Description	Part Number
Oxygen Monitoring Accessories	Oxygen Sensor Capsule	6850645
	Sensor Housing & Cable Assembly	4106363
	Inspiratory Valve Dome	4108329
	Inspiratory Valve Dome Plug	4106387
Breathing Pressure Monitoring Accessories	Breathing Pressure Pilot Line (to absorber)	4109368
	Breathing Pressure Pilot Line (with Luer to Y-piece)	4108528
Respiratory Volume Monitoring Accessories	Flow Sensor Assembly	4115754
	Connector Hose Assembly	4114912
	Flow Housing	4114444
	Transducer Set	4114445
	O-ring Set	4115147
Pulse Oximetry Accessories	Interface cable w/pre-amp	4108982
	Interface cable extension	4110686
	Oxygen Transducer (reusable)	4113823
	Oxygen Transducers (disposable)	
	D-25 (Adult, adhesive, flexible)	4108984
	D-20 (Older children & small adults, adhesive, flexible)	4108985
	R-15 (Mounts on bridge of nose--ind. for severe vasoconstriction, adhesive, flexible)	4108986
	N-25 (Neonates up to 3 kg, adhesive, flexible)	4108987
	I-20 (Infants between 3 & 15 kg, adhesive, flexible)	4108988
Noninvasive Blood Pressure Monitoring Accessories	Newborn cuff	4109596
	Infant cuff	4109595
	Pediatric cuff	4109094
	Adult cuff	4109095
	Large adult cuff	4109096
	Thigh cuff	4109597
	Extension hose	4108971
Respiratory Gas Analysis Accessories	15 mm Adapter/Filter	4108104
	Sample Line (96 in)	4108103
	Water Trap Reservoir	4110616
	Gas Analyzer Calibration Kit	4110683
	Air Filter	4111751

Appendix A
Spare and Replacement Parts

Communication Cables

DB9/DB9/2.5 ft for use with Vitalink	4110328
DB9/DB25/8 ft for use with Hewlett-Packard MECIF	4112318
DB9/DB25/8 ft for use with SpaceLabs DataLogger	4112349
DB9/DB25/8 ft for use with Marquette TramNet	4112442
DB9/DB9/8 ft for use with Marquette Tramscope	4113117
DB9/DB9/8 ft for use with Datex AS/3	4112477
DB9/DB25/8 ft for use with Datex CARDIOCAP and CAPNOMAC	4113314
DB9/DB25/8 ft for use with Criticare Poet IQ	4112318-002
DB9/DB9/8 ft for use with Criticare 1100	4110328-003
DB9/DB25/8 ft for use with Datascope Multinex	4113142
DB9/SDL/8 ft for use with Datascope Passport and Point-of-View	4113242-002
DB9/SDL/8 ft for use with Siemens SIRECUST	4113242-001
DB9/DB25/8 ft for use with Puritan-Bennett	4113142-001
DB9/DIN/8 ft for use with Colin BP-508	4113241
DB9/DB25/8 ft for use with Criticon Dinamap	4113142-002
DB9/DB9/8 ft for use with Nellcor N-1000 and N-2500	4113503
DB9/DB9/8 ft for use with Ohmeda RGM	4113566
DB9/DB25/8 ft for use with Ohmeda Rascal	4112318-003

O.R. Data Manager

Laser Printer	4111380
Printer Cable (8 feet)	4110568
Printer Cable (50 feet)	4111626
Floppy Disk (3.5"/pkg of 10)	4111462

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Appendix B
NARKOMED 4 Exam

Narkomed 4 Operator's Exam

The purpose of this exam is to promote North American Dräger's commitment to patient safety by familiarizing the operator with the Narkomed 4 anesthesia system.

This examination is divided into two parts. Part I is a matching examination where you must write the letter of the callout for a part or component next to its written description. Part II consists of 14 questions. Each question has multiple true or false answers that must be answered.

This examination is to be photocopied so that all operators may take this exam to ensure familiarity with the equipment.

Appendix B
NARKOMED 4 Exam

Part I

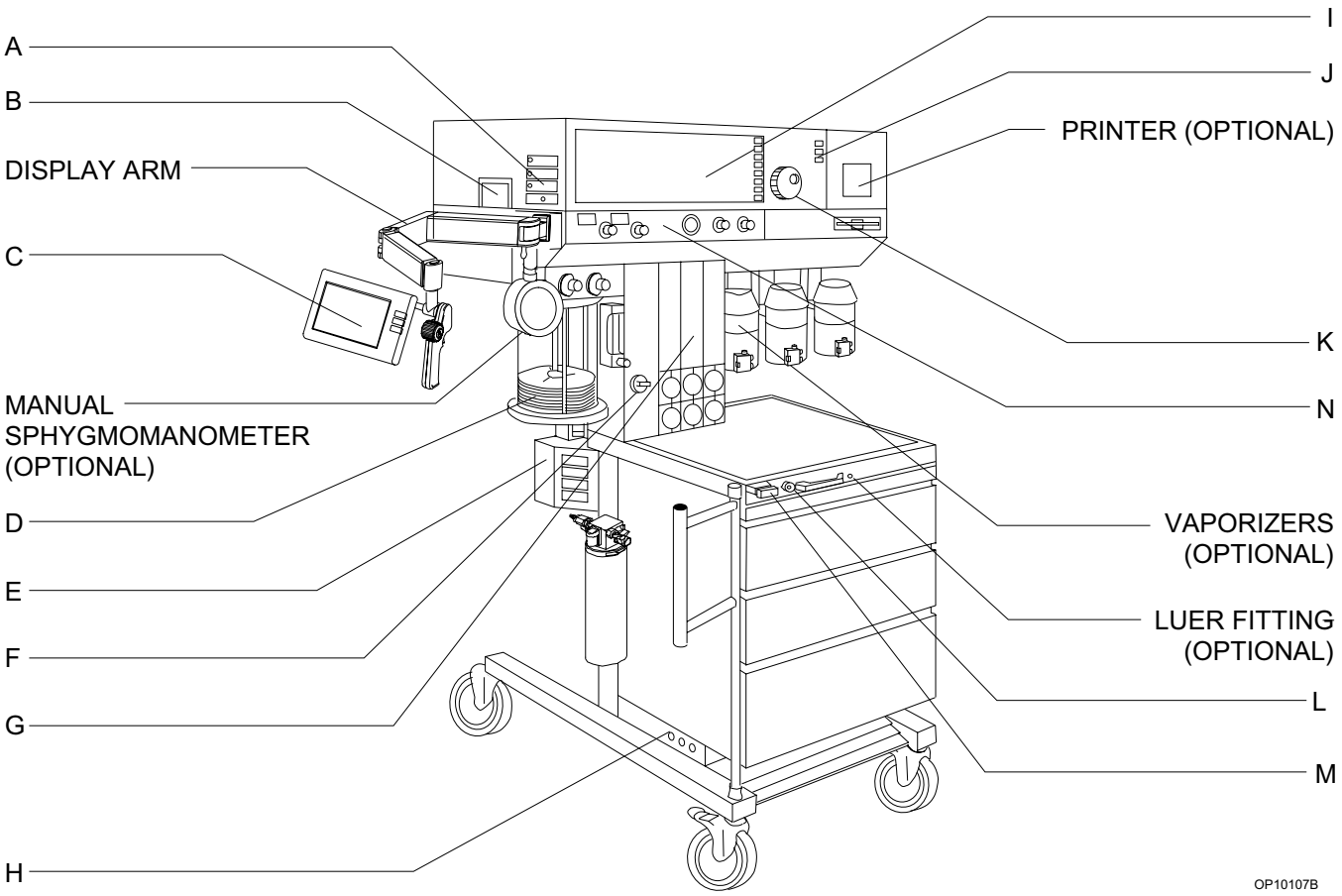

Figure 1 NARKOMED 4 Anesthesia System, Front View

Match the following controls or indicators with the correct letter.

_____	Selection Dial	_____	Fresh Gas Outlet
_____	Circuit Breakers	_____	Main Display
_____	O_2 Flush	_____	SpO_2/N.I.B.P Interface
_____	Control Key Panel (Audio Silence)	_____	Volume/O_2/Pressure Interface
_____	Main Switch	_____	Ventilator Bellows
_____	Remote Display	_____	Ventilator
_____	Flow Meters	_____	Water Trap

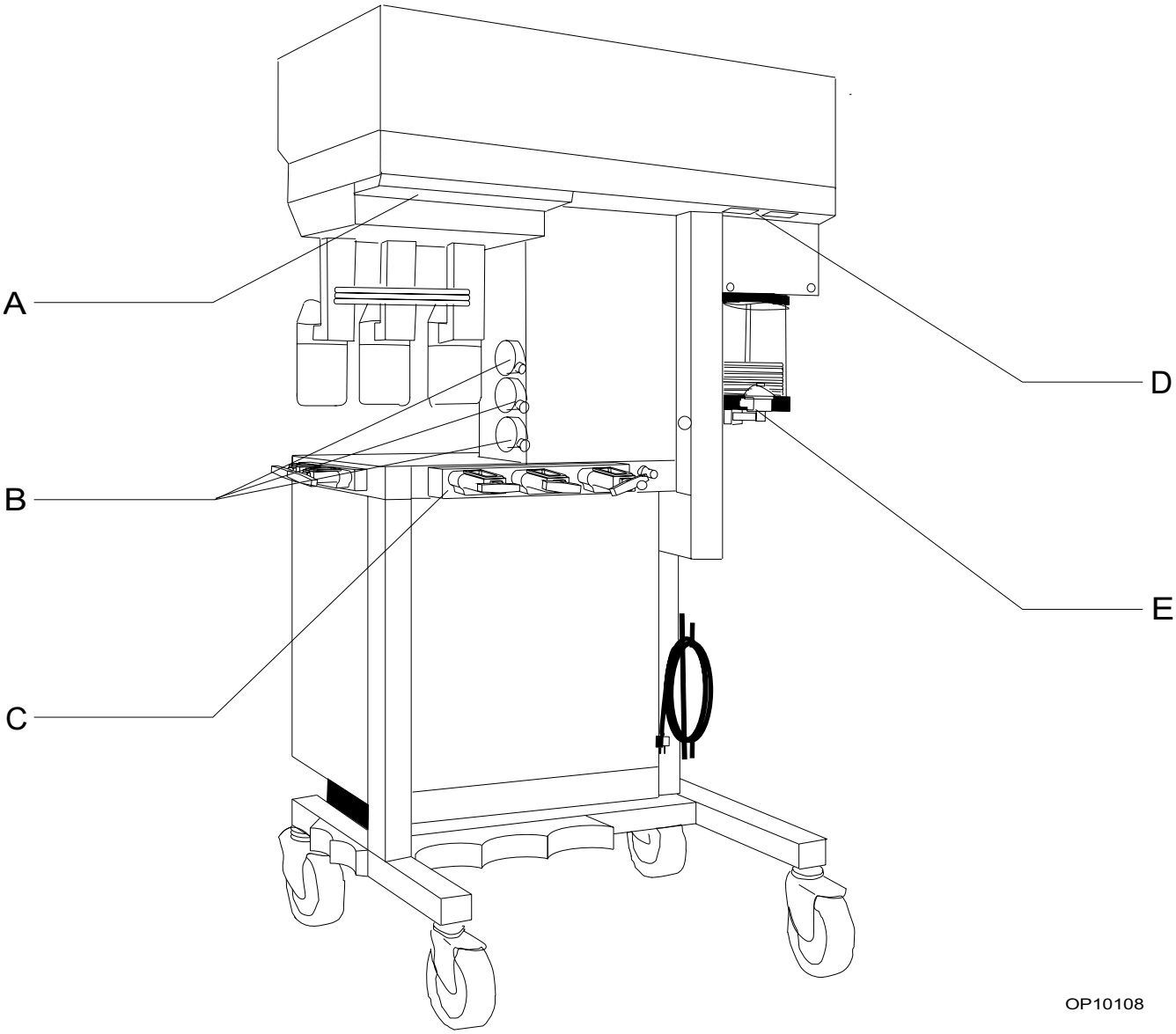

Figure 2 NARKOMED 4 Anesthesia System, Back View

Match the following components with the correct letter.

_____ External Communication Interface Panel

_____ D.I.S.S. Pipeline Inlets

_____ A.C. Convenience Receptacles

_____ Cylinder Yokes

_____ Ventilator Scavenger Connection

Appendix B
NARKOMED 4 Exam

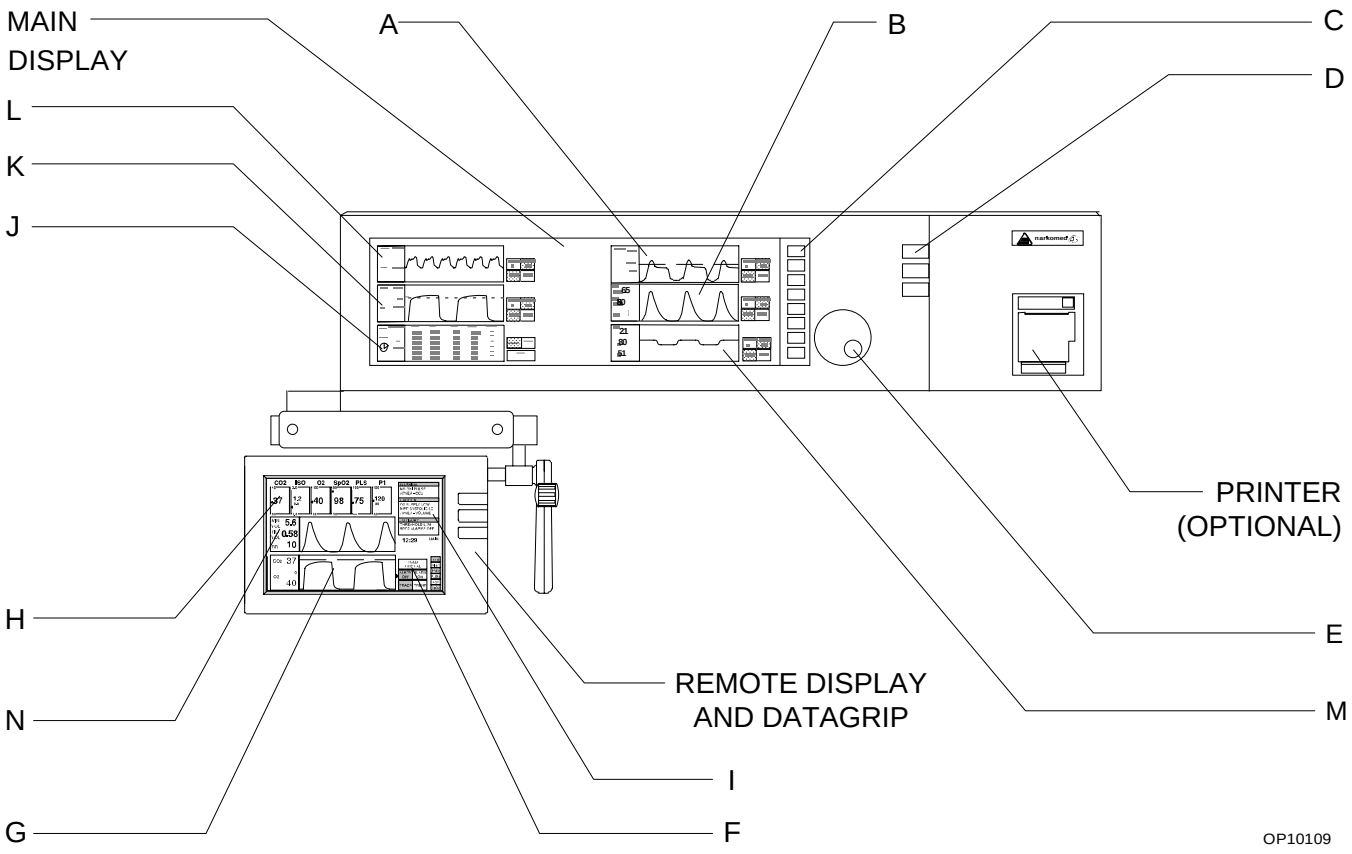

Figure 3 NARKOMED 4 Monitoring System Layout

Match the following controls or indicators with the correct letter.

_____	Breathing Pressure	_____	Silence Key
_____	Pulse Oximeter	_____	Respiratory Volume
_____	Selection Dial	_____	Numeric Windows
_____	Monitor Key	_____	Agent
_____	CO_2 and O_2	_____	Datagrip Selections
_____	Central Alarms	_____	Noninvasive Blood Pressure
_____	Monitoring Display	_____	Upper Trace Window

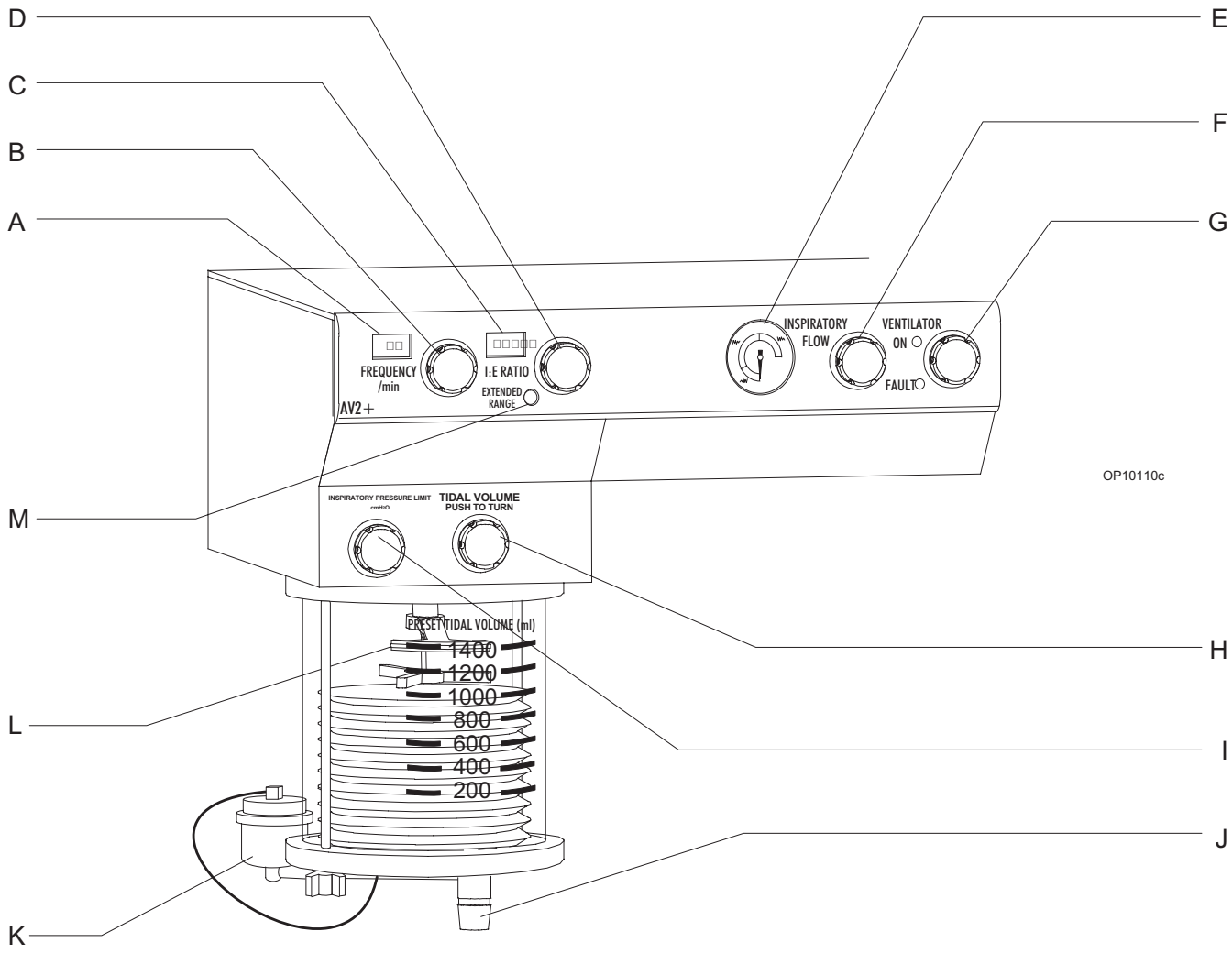

Figure 4 NARKOMED 4 AV2+ Ventilator

Match the following controls or indicators with the correct letter.

_____ Frequency Control
_____ Tidal Volume Control
_____ Breathing Circuit Connector
_____ Inspiratory Flow Gauge
_____ Ventilator Relief Valve
_____ Frequency Display
_____ Extended Range Access
_____ Ventilator On-Off Control
_____ Tidal Volume Setting Indicator
_____ I:E Ratio Control
_____ Inspiratory Flow Control
_____ I:E Ratio Display
_____ Pressure Limit Control

Appendix B
NARKOMED 4 Exam

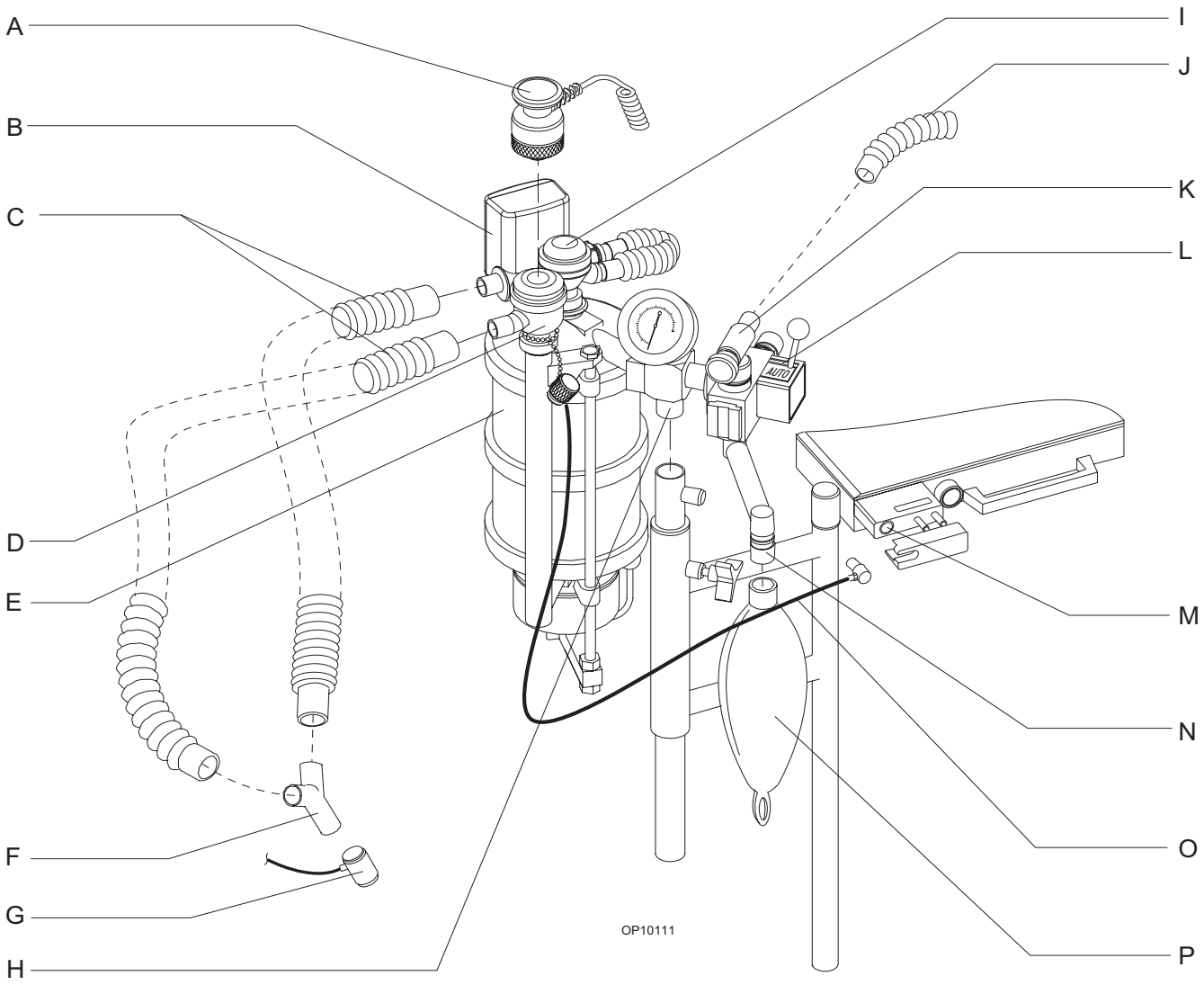

Figure 5 NARKOMED 4 Absorber

Match the following items with the correct letter.

___ APL Valve	___ Fresh Gas Hose	___ CO_2 Monitor Airway Adapter
___ Fresh Gas Outlet	___ O_2 Analyzer	
___ Breathing Bag	___ Volume Monitor Sensor	___ Swivel Bag Mount
___ MANUAL/AUTOMATIC Selector Valve	___ 22mm Breathing Hose	___ Absorber Mounting Stud
___ 19mm Scavenger Hose	___ Absorber	___ Y Piece
___ Expiratory Valve		___ Inspiratory Valve

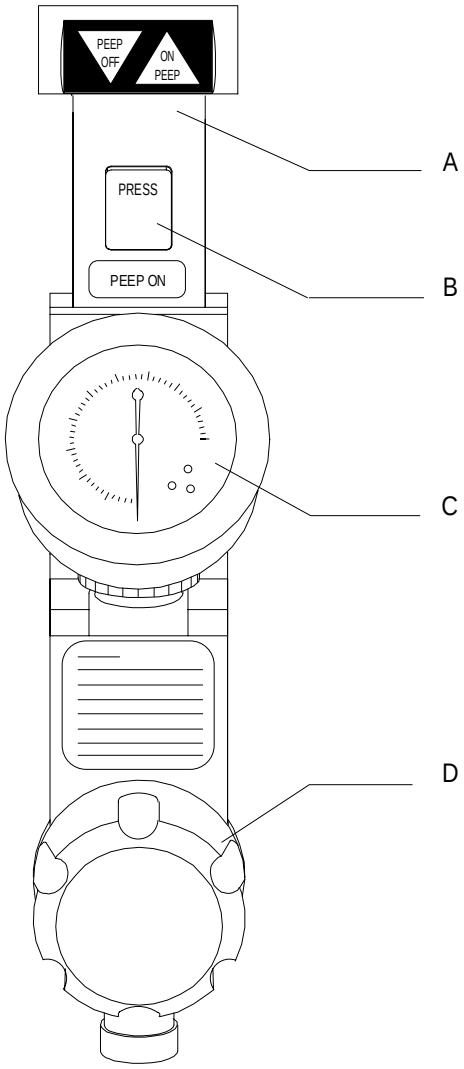

Figure 6 Optional PEEP Valve

Match the following items with the correct letter.

_____ Latch

_____ PEEP Control Valve

_____ PEEP Bypass Control

_____ Breathing Pressure Gauge

Appendix B
NARKOMED 4 Exam

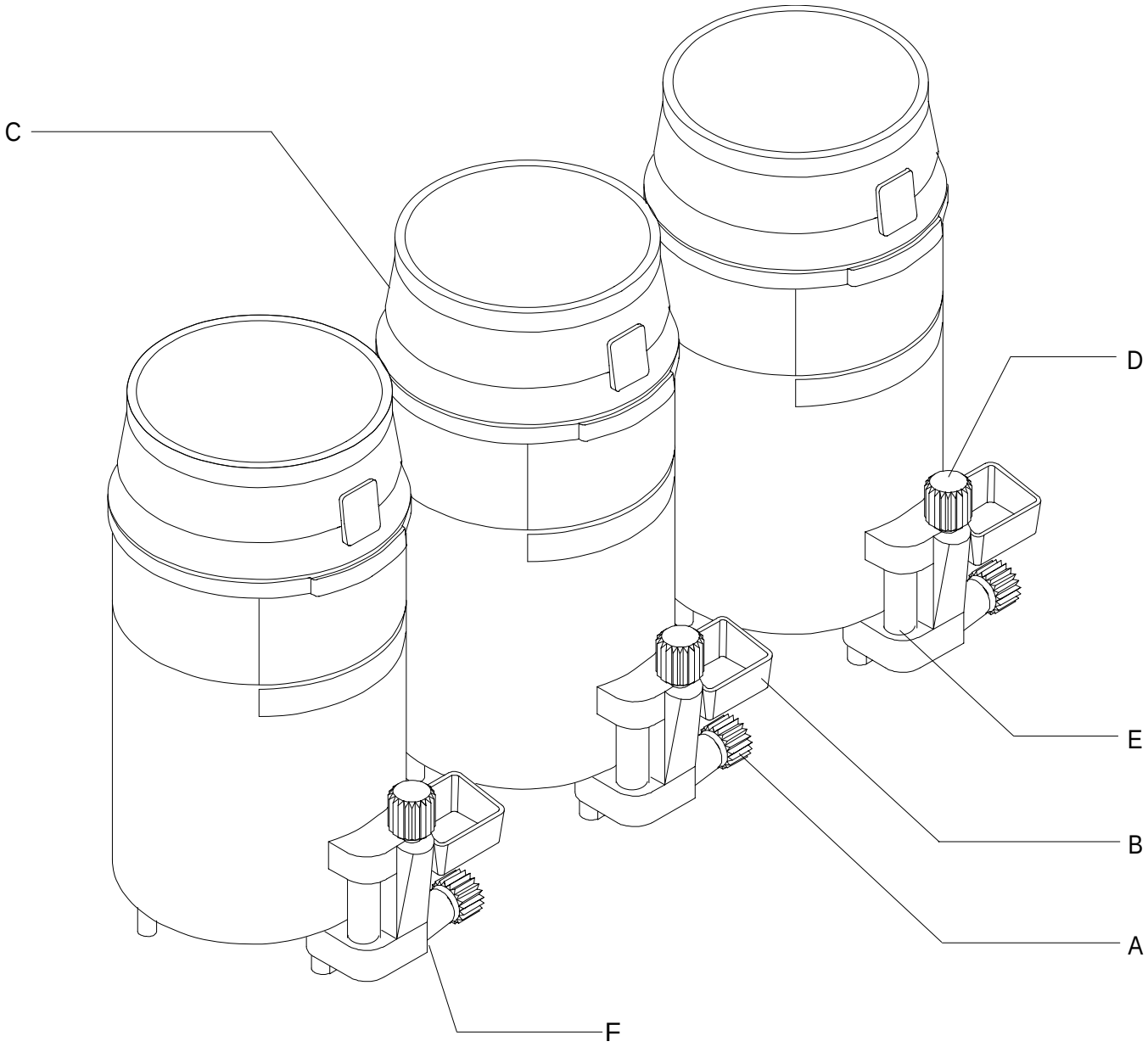

Figure 7 Vaporizers (with Standard Filler/Drain Mechanisms)

Match the following controls or indicators with the correct letter.

_____	Filler Valve	_____	Drain Valve
_____	Sight Glass	_____	Drain Port
_____	Filler Funnel	_____	Handwheel Adjustment

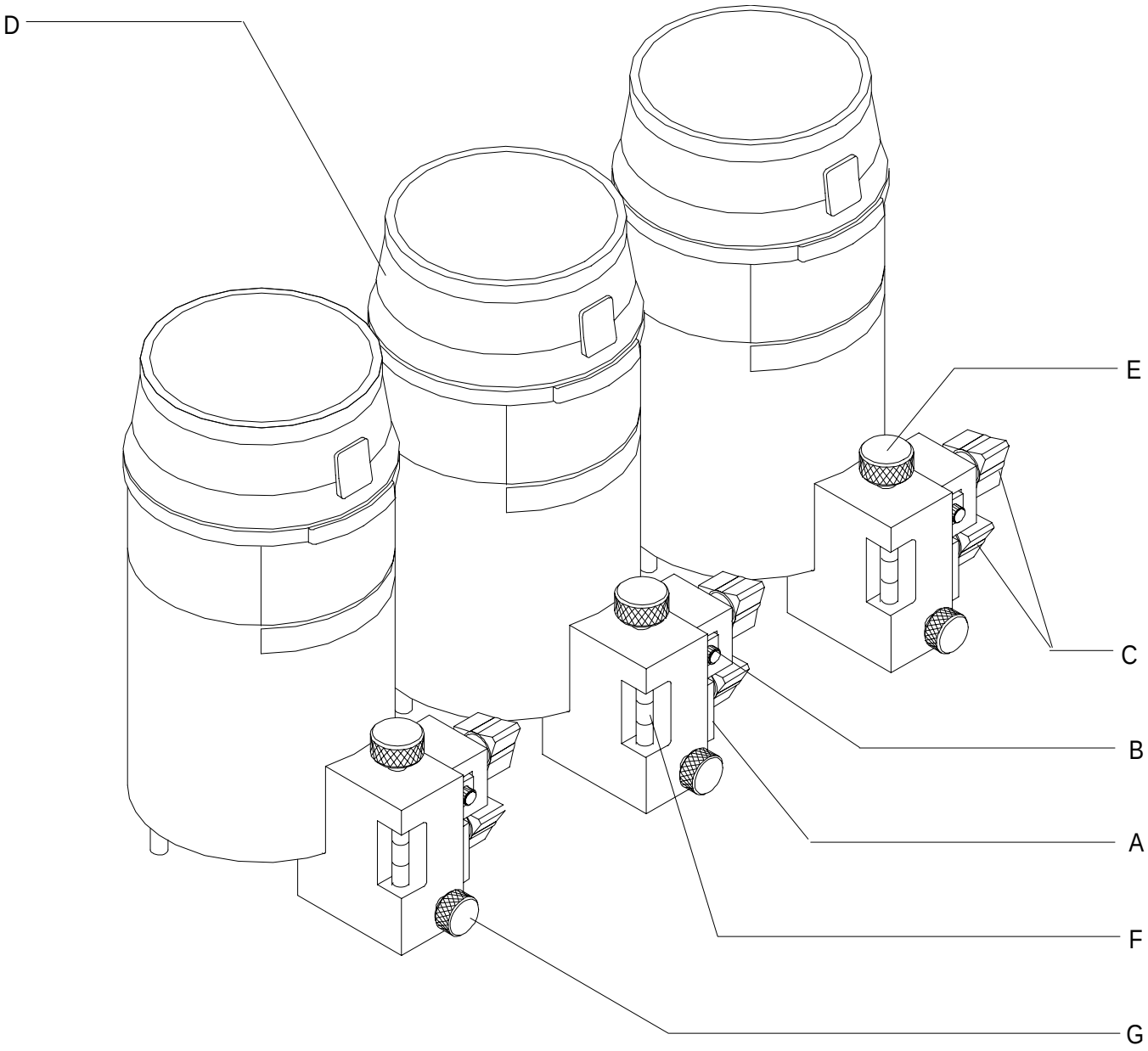

Figure 8 Vaporizers (with optional Pin-Indexed Filler/Drain Mechanisms)

Match the following controls or indicators with the correct letter.

_____ Filler Valve

_____ Sight Glass

_____ Wing Screws

_____ Drain Port

_____ Handwheel Adjustment

_____ Drain Valve

_____ Filler Port

Appendix B
NARKOMED 4 Exam

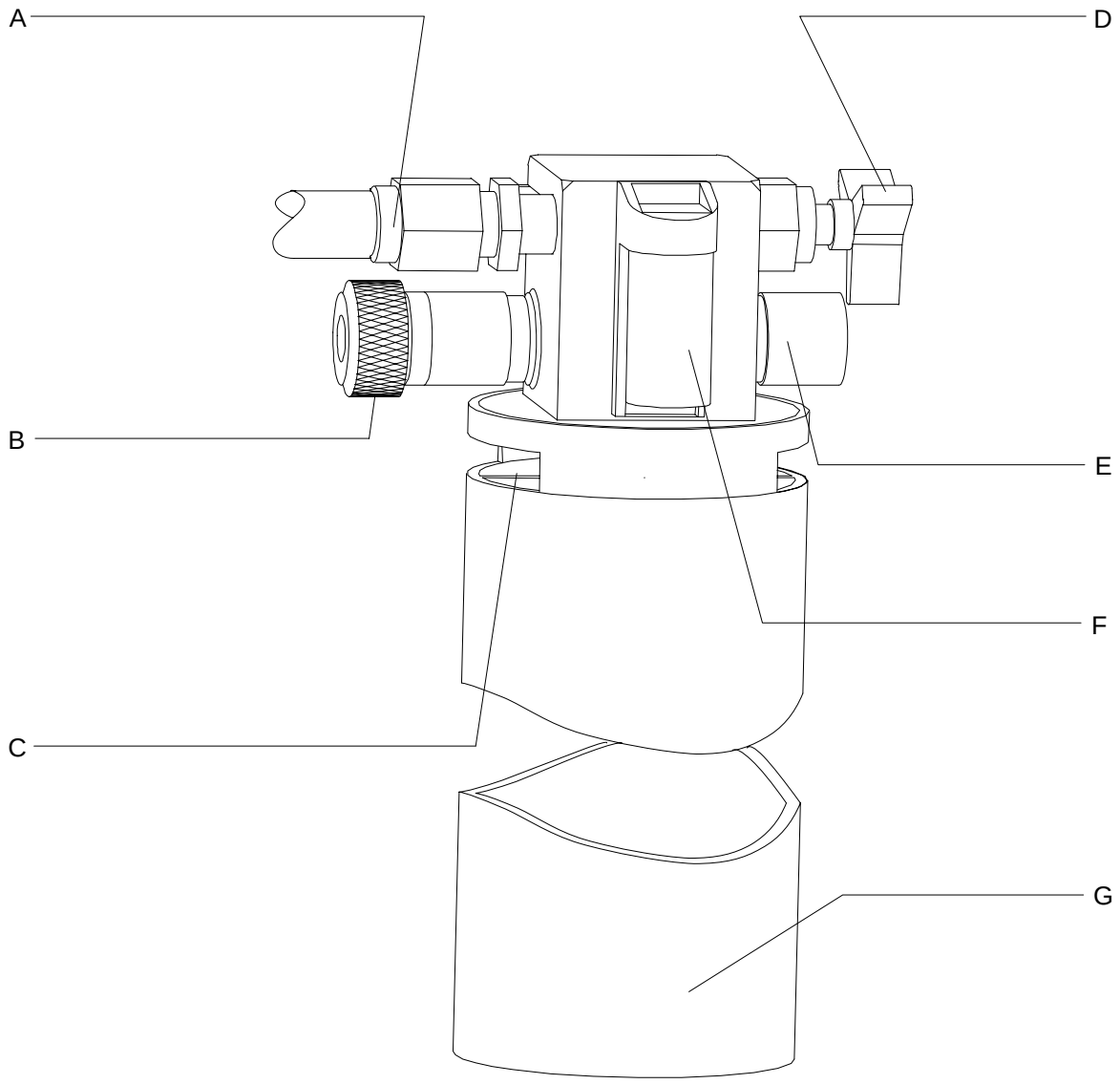

Figure 9 Open Reservoir Scavenger

Match the following items with the correct letter.

_____	Input Port Cap	_____	19mm Scavenger Hose Connection
_____	D.I.S.S. Vacuum Hose	_____	Reservoir Canister
_____	Flowmeter	_____	Relief Port
_____	Suction Flow Adjustment		

PART II

Answer YES or NO to the following questions.

1. During AC line power failure, the following changes occur in a Narkomed 4:

   ____ A. Power supply automatically switches to battery back-up.
   ____ B. AC power fail indicator light goes on.
   ____ C. The AC convenience receptacles lose power.
   ____ D. A single tone audio alarm sounds.

2. What information is displayed on the left screen of the main display?

   ____ A. Pulse oximeter.
   ____ B. Airway pressure.
   ____ C. Noninvasive blood pressure.
   ____ D. Oxygen concentration.

3. The monitor setup screens allow you to set which of the following?

   ____ A. Interlock between SPO_2 and NIBP.
   ____ B. Adult/neonatal mode on NIBP.
   ____ C. Adjust pulse tone volume.
   ____ D Oxygen sensor calibration.

4. In order to calibrate the O_2 monitor in a Narkomed 4, you must expose the sensor to 21% O_2 and:

   ____ A. Press the "MONITOR SETUP" key.
   ____ B. Set the LO O_2 alarm limit.
   ____ C. Set up the HI O_2 alarm limit.
   ____ D. Press the "O_2 CAL" soft key.

5. The Narkomed 4 displays breathing pressure information in which of the following ways:

   ____ A. Mean pressure.
   ____ B. PEEP.
   ____ C. Peak pressure.
   ____ D. Pressure waveform.

6. To change the audio tone volume on the pulse oximeter, you must:

   ____ A. Press the monitor setup key.
   ____ B. Set the high alarm limit for oxygen saturation.
   ____ C. Touch the "TONE VOL" bar graph.
   ____ D. Rotate the selection dial in the desired direction (up or down in volume).

Appendix B
NARKOMED 4 Exam

7. The message "AGENT DETECTED" appears as a caution when:

   ____ A. No agent has been selected.
   ____ B. Any agent is detected at greater than 0.5% Vol.
   ____ C. Agent contamination in the O.R. exceeds 100 ppm.
   ____ D. More than one vaporizer is turned "on".

8. To set the threshold pressure alarm limit on the breathing pressure monitor, you must:

   ____ A. Press the "MONITOR SETUP" key.
   ____ B. Touch the soft key for the threshold alarm limit.
   ____ C. Rotate the selection dial in the desired direction.
   ____ D. Touch the "AUTOSET" soft key.

9. To adjust the audio volume for the alarms on the Narkomed 4, you must:

   ____ A. Press the "SYSTEM CONFIG" key on the main panel.
   ____ B. Touch the "SYSTEM FUNCTIONS" soft key.
   ____ C. Touch "AUDIO VOLUME" soft key.
   ____ D. Rotate selection dial to change the value to desired setting.

10. Which of the following can result in erratic SpO_2 measurements:

   ____ A. Excessive patient motion.
   ____ B. Defective O_2 sensor.
   ____ C. Interference from electrostatic unit.
   ____ D. Patient has poor peripheral perfusion.

11. To adjust the oxygen concentration alarms on the Narkomed 4, you must:

   ____ A. Press "MONITOR SETUP" key.
   ____ B. Touch soft key for specific alarm limits.
   ____ C. Touch "SAVE" soft key.
   ____ D. Rotate selection dial to desired value.

12. To adjust the CO_2 alarm limits on the Narkomed 4, you must:

   ____ A. Press "MONITOR SETUP" key.
   ____ B. Touch soft key for specific alarm limits.
   ____ C. Rotate selection dial to desired value.
   ____ D. Touch "SAVE" soft key.

13. When the AV2+ ventilator is turned on, which of the following occurs?

____ A. The volume alarms are enabled.
____ B. The apnea pressure alarms are enabled.
____ C. The CO_2 alarms are enabled.
____ D. The pulse oximeter alarms are enabled.

14. The bellows on the AV2+ ventilator will not collapse during inspiration. Some possible causes for this problem are:

____ A. Manual/Automatic selector valve in "BAG" position.
____ B. Inspiratory flow control setting on ventilator too low.
____ C. Excessive suction applied to the scavenger system.
____ D. PEEP valve value set too "high".

Appendix B
NARKOMED 4 Exam

Narkomed 4 Operator's Examination Answers

Appendix B
NARKOMED 4 Exam

Part I

Figure 1

K	Selection Dial	M	Fresh Gas Outlet
H	Circuit Breakers	I	Main Display
L	O_2 Flush	A	SpO_2/N.I.B.P Interface
J	Control Key Panel (Audio Silence)	E	Volume/O_2/Pressure Interface
F	Main Switch	D	Ventilator Bellows
C	Remote Display	N	Ventilator
G	Flow Meters	B	Water Trap

Figure 2

A	External Communication Interface Panel
B	D.I.S.S. Pipeline Inlets
D	A.C. Convenience Receptacles
C	Cylinder Yokes
E	Ventilator Scavenger Connection

Figure 3

A	Breathing Pressure	D	Silence Key
L	Pulse Oximeter	B	Respiratory Volume
E	Selection Dial	H	Numeric Windows
C	Monitor Key	M	Agent
K	CO_2 and O_2	F	Datagrip Selections
I	Central Alarms	J	Noninvasive Blood Pressure
G	Monitoring Display	N	Upper Trace Window

Appendix B
NARKOMED 4 Exam

Figure 4

B	Frequency Control	G	Ventilator On/Off Control
H	Tidal Volume Control	L	Tidal Volume Setting Indicator
J	Breathing Circuit Connector	D	I:E Ratio Control
E	Inspiratory Flow Gauge	F	Inspiratory Flow Control
K	Ventilator Relief Valve	C	I:E Ratio Display
A	Frequency Display	I	Pressure Limit Control
M	Extended Range Access		

Figure 5

K	APL Valve	O	Fresh Gas Hose	G	CO_2 Monitor Airway Adapter
M	Fresh Gas Outlet	A	O_2 Analyzer		
P	Breathing Bag	B	Volume Monitor Sensor	N	Swivel Bag Mount
L	Manual/Automatic Selector Valve	C	22mm Breathing Hose	H	Absorber Mounting Stud
J	19mm Scavenger Hose	E	Absorber	F	Y Piece
I	Expiratory Valve			D	Inspiratory Valve

Figure 6

B	Latch
D	PEEP Control Valve
A	PEEP Bypass Control
C	Breathing Pressure Gauge

Figure 7

D	Filler Valve	A	Drain Valve
E	Sight Glass	F	Drain Port
B	Filler Funnel	C	Handwheel Adjustment

Figure 8

E	Filler Valve	D	Handwheel Adjustment
F	Sight Glass	G	Drain Valve
C	Wing Screws	B	Filler Port
A	Drain Port		

Figure 9

B	Input Port Cap	E	19mm Scavenger Hose Connection
A	D.I.S.S. Vacuum Hose	G	Reservoir Canister
F	Flowmeter	C	Relief Port
D	Suction Flow Adjustment		

Appendix B
NARKOMED 4 Exam

PART II

1.
Y A.
Y B.
Y C.
Y D.

2.
Y A.
N B.
Y C.
Y D.

3.
Y A.
Y B.
Y C.
Y D.

4.
Y A.
N B.
N C.
Y D.

5.
Y A.
Y B.
Y C.
Y D.

6.
Y A.
N B.
Y C.
Y D.

7.
Y A.
Y B.
N C.
N D.

8.
Y A.
Y B.
Y C.
N D.

9.
Y A.
Y B.
Y C.
Y D.

10.
Y A.
Y B.
Y C.
Y D.

11.
Y A.
Y B.
N C.
Y D.

12.
Y A.
Y B.
Y C.
N D.

13.
Y A.
Y B.
N C.
N D.

14.
Y A.
Y B.
N C.
N D.

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